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The Province of Alberta

PETROLEUM AND NATURAL GAS CONSERVATION BOARD

IN THE MATTER OF THE GAS RESOURCES PRESERVATION ACT

AND IN THE MATTER of a Joint Hearing to determine various questions
relating to the proposed Export of Natural Gas from the Province of Alberta.

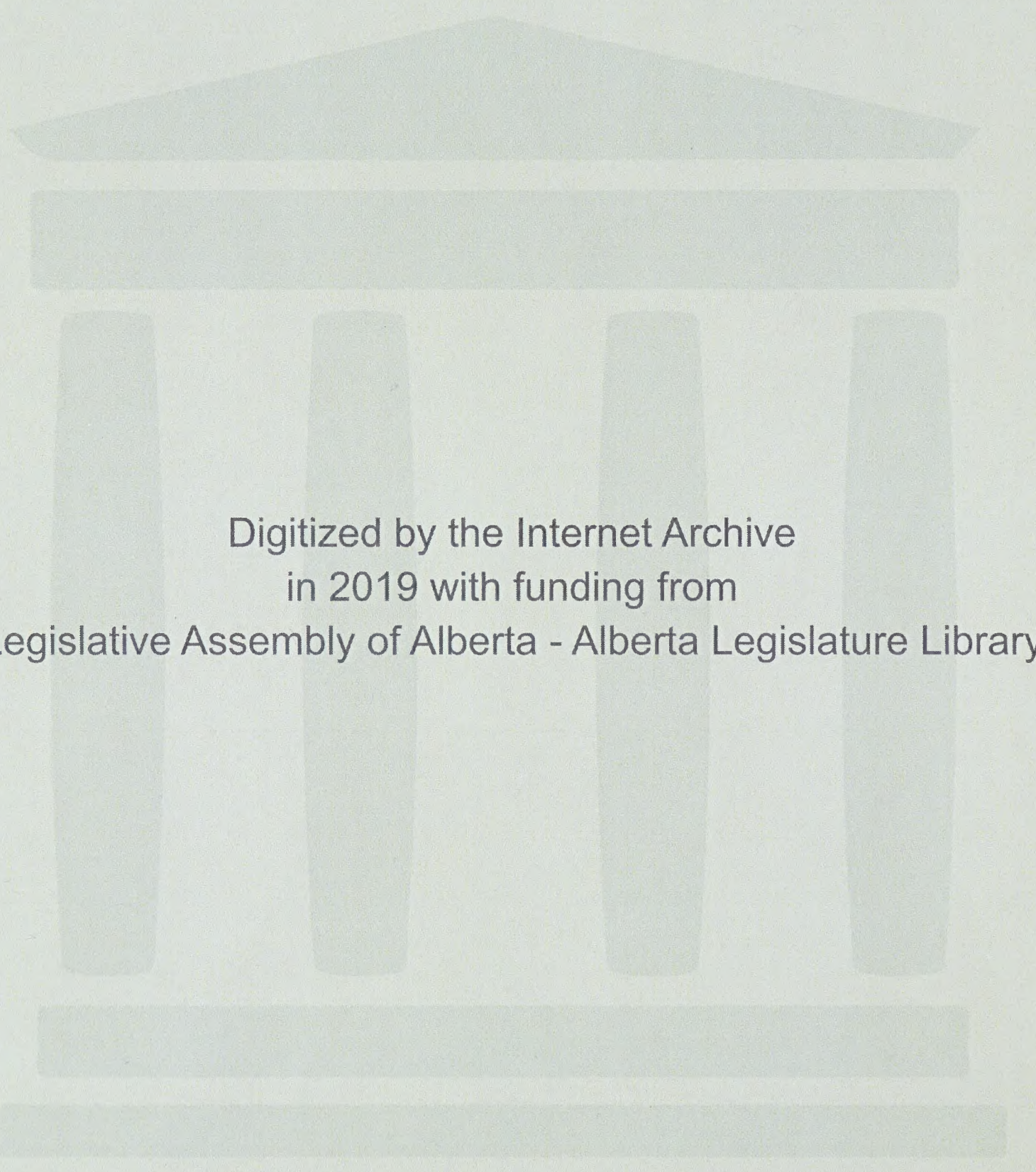
I. N. McKinnon Esq., Chairman

D. P. Goodall Esq.

Dr. G. W. Govier

Session: October 31, 1950.

Volume 2.



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VOLUME 2.

October 31, 1950.

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October 31st, 1950.

THE CHAIRMAN: Gentlemen, it has been suggested to the Board that a great deal of time could be saved by having people making submissions not read the submission in detail, but rather to be given an opportunity to highlight their submissions and, further, that any submission marked as an exhibit not be put in the transcript.

Now, there will be some exceptions to that, particularly in the case of very brief submissions. However, if any counsel desires to have any exhibit put in the transcript, if he will ask the Board, he will be given permission to do that.

MR. C. E. SMITH: Mr. Chairman, may I suggest, and I think that you suggested yesterday, that I be permitted to call Mr. Lang and then Mr. Russell with regard to submissions by the Research Council and by the Power Commission, and, probably, Mr. Davis could be recalled to the stand after that. Mr. Lang.

.....

WILLIAM ALBERT LANG, having been first duly sworn, examined by Mr. C.E. Smith, testified as follows:

Q Mr. Lang, you are the secretary of the Research Council of Alberta?

A That is correct.

Q And I believe your Council has prepared a submission in writing?

A That is correct.

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Q And that submission, as you know, was distributed here yesterday to the various counsel and interested parties?

A Yes.

Q And I think before the actual submission is tendered to this Board that there are two or three clerical errors, I guess I might call them that, in the submission that you want to draw the attention of the Board to, is that correct?

A Yes, sir.

Q I wonder if you would refer to them now so that all may correct the submission?

A Mr. Chairman, this submission was prepared jointly by three members of the technical staff of the Research Council of Alberta, namely, Dr. Donald Quon, Research Chemist, Natural Gas Project, Mr. John Gregory, Industrial Engineer, and myself. Like many such documents this submission's preparation at the end was hurried, and there are some errors that I would like to correct at this time.

THE CHAIRMAN: The submission will be marked
Exhibit J-8.

SUBMISSION BY RESEARCH COUNCIL
OF ALBERTA MARKED EXHIBIT J-8.

Q MR. C. E. SMITH: Will you go ahead, Mr. Lang?

A The most serious error is on Page 41, the end of the third paragraph, the last sentence. I will read the sentence as it is here and then suggest the correction. "One need only point out that the Alberta Nitrogen Company ammonia plant uses more natural gas than the whole of the City of Calgary." The writer of that section, I think, wished to include a comparison that was put in the submission which had been presented to the Dinning Commission, and I will read just the section there, "Compared to the requirements

Q And that admission, as you know, was distributed here yesterday to the various counsel and interested parties?

A And I think before the actual admission is referred to this Board just there are two or three other errors. I guess I might add that, in the admission that you want to draw the attention of the Board to, is that correct?

Yes, sir.
I wonder if you would refer to that now so that all may correct the admission?

Mr. Chairman, this admission was prepared jointly by three members of the technical staff of the Research Council of Alaska, namely, Mr. Harold Wood, Research Director, Natural Gas Project, Mr. John Gregory, Industrial Engineer, and myself. Like any such document this admission is composed of the end was hurried, and there are some errors that I would like to correct at this time. The admission will be marked

SUBMISSION BY RESEARCH COUNCIL
OF ALASKA DATED JANUARY 1-2

Will you go ahead, Mr. Jones?
The admission given is on page 41, item of the third paragraph, the last sentence. I will read the sentence as it is now and then suggest the correction. "One need only point out that the Alaska Pipeline Company cannot place more material gas than the whole of the City of Calgary." The writer of that section, I think, wished to include a comparison that was put in the admission when it was presented to the Planning Commission, and I will read that the section there, "Compared to the requirements

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of the City of Calgary the synthetic ammonia plant uses one and one-third times as much electric power, one and a half times as much water, and one-third as much natural gas." Therefore, I would like to have this corrected to read, "One need only point out that the Alberta Nitrogen Company ammonia plant uses approximately one-third as much natural gas as the City of Calgary." I checked the figures yesterday regarding that, and that is correct. The City of Calgary uses, or used in 1949, just over 18 billion cubic feet of natural gas. The Ammonia Plant used approximately 3.6 billion cubic feet, so that you have approximately one-third.

Q Just a minute, Mr. Lang, but that makes about one-sixth to me?

A Well, if you take the difference between the amount I am taking, just using the City of Calgary, you see, if you take the 3.6 away from the 18.1, it will give you 14.6 so that is 3.6 as compared with 14.6. Is that clear?

Q No, I am sorry, I may be stupid but it is not clear to me. It may be to the rest of the people here?

A Well, I am excluding the amount of gas that is used by the Nitrogen Plant from the total used by Calgary.

Q The amount used by the plant is included in your Calgary total, is that what you mean?

A It is included in this 18.1.

Q Well, if you take 3 something away from 18, is that correct?

A Yes, that is correct, and that leaves a balance of 14.6, and 3.6 of 14.6 is roughly, approximately one-third.

Q Well, it doesn't seem to be right to me.

MR. FENERTY: Well, it is around 3 billion.

of the City of Calgary the standardization of the
one and one-half times as much electricity power, and
half times as much water, and one-third as much
gas. Therefore, I would like to have this corrected
read, "One needs only point out that the electric nitrogen
company's standard plant uses approximately one-third as
much natural gas as the City of Calgary." I checked the
figures yesterday regarding that, and that is correct.
The City of Calgary used, or used in 1957, just over 15
million cubic feet of natural gas. The American
used approximately 5.5 million cubic feet, so that you
have approximately one-third.
That is correct, Mr. Jones, but that makes about one-third

A: Well, if you take the difference between the amount I
am taking, just using the City of Calgary, you see, if you
take the 5.5 away from the 15.5, it will give you 10.0
so that is 5.5 as compared with 15.5. Is that clear?
Q: I am sorry, I may be stupid but it is not clear to me.
It may be to the rest of the people here.
A: Well, I am excluding the amount of gas that is used by the
Nitrogen Plant from the total used by Calgary.
Q: The amount used by the plant is included in your Calgary
total, is that what you mean?

A: It is included in this 15.5.
Q: Well, if you take 5.5 away from 15.5, it will give you
10.0, that is correct, and that leaves a balance of 10.0,
and 5.5 as well, is that right, approximately one-third.
Q: Well, it seems to me to be right to me.
A: Yes, Mr. Jones, it is about 3.3 million.

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Dir. Ex. by Mr. C. E. Smith

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- THE CHAIRMAN: It is around one-quarter.
- MR. STEER: Well, anyway, the figures are there anyway.
- MR. FENERTY: It does not matter.
- Q THE CHAIRMAN: Is that ratio 14.6 to 3.6, Mr. Lang?
- A Yes. The City of Calgary, exclusive of the Alberta Nitrogen plant, uses 14.571.
- Q Well, 3.6 is approximately one-quarter of that?
- A Well.....
- Q MR. C. E. SMITH: Four times 3.6 is 14.4, isn't it, Mr. Lang?
- A Well, my mathematics are poor, Mr. Smith.
- Q Don't trust mine, Mr. Lang.
- THE CHAIRMAN: Will you proceed, Mr. Lang?
- Q MR. C. E. SMITH: Will you change that to one-quarter instead, Mr. Lang?
- A If you change that to one-quarter, that is satisfactory.
- Q MR. FENERTY: The same thing occurs on another page?
- A The same thing occurs on the third page of the Summary, which is at the first of the submission, in Section 7.
- Q MR. S. B. SMITH: What page?
- A It is the third page of the Summary.
- Q MR. C. E. SMITH: The second last line in Paragraph 7?
- A "For example, the Alberta Nitrogen Company ammonia plant uses approximately one-quarter as much natural gas as the City of Calgary."
- Q Is there any other correction, Mr. Lang?

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A There is a correction on page 23, the fourth last line, where it says that "Since the City of Edmonton power plant converted their three boilers", that should read "converted three of their boilers".

MR. FENERTY: Pardon?

A "Converted three of their boilers."

Q MR. McDONALD: How many boilers have they altogether, Mr. Lang, do you know?

A I do not know entirely.

Q MR. C. E. SMITH: Is there another correction? And the next correction is on page 24, and this correction has been made in the submission already, that is, that generation of at least 500 million kilowatt hours per year from natural gas is a distinct possibility. That is the last line on page 24.

Q That has already been made in all the copies?

A It has been made in all the copies.

Q Those are the corrections, are they, Mr. Lang?

A Yes, those are the corrections.

Q Having regard to what the Chairman just said, I suggest that you read the Introduction and Summary and the balance may be taken as read subject to any desire you have to highlight any particular point in it, or subject to anything counsel wants to mention. Would you then read those three portions of it?

A Yes, sir.

NATURAL GAS IN RELATION TO THE INDUSTRIAL

DEVELOPMENT OF ALBERTA

I INTRODUCTION

It is generally agreed, that in our present civilization,

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industrial development will be greatest in those areas in which energy can be most economically produced and efficiently used, where raw materials are abundant, where labour is in adequate supply and markets for the products of industry are available. Alberta, a rich agricultural province, has potential reserves of energy in the form of coal, oil, natural gas, bituminous sand and hydropower. In addition, large areas of forest occur in the western and northern parts of the province and deposits of limestone, shale, clay, sand, salt, etc. occur in other sections of the province. But being a young province with a limited population, Alberta is as yet not industrialized to any great extent. The combination of agriculture and industry, however, points to a bright future. Every effort should be made, therefore, to develop the natural resources efficiently, to avoid waste, and so far as possible to see that the immediate program ensures a sound basis on which to build an orderly and systematic development in the future. In this way, the economic welfare of the people of the province can be better provided for, and the province thereby contribute to the welfare of Canada as a whole.

Therefore, in making a summary appraisal of the future role of natural gas in the industrial development of Alberta, it is suggested, that as the population and income of the province continues to increase, an abundance of cheap natural gas will facilitate the introduction and/or expansion of many different industries whose growth is economically feasible. This is because natural gas is not only a prime source of heat

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and power but also an important raw material for chemical industries.

In supporting this thesis it is hardly necessary to state that economists have highlighted the relationship of cheap energy to industrial power.....

Q Industrial what? I have "development"?

A Pardon me, cheap energy to industrial development, pointing out on the basis of assembled data, that in the last century the ratio of total energy output to national income in the United States, measured in comparable dollars, has remained relatively constant. As income rose so rose energy consumption. Thus as new technological advances were made and new sources of income developed, the energy industries have been called upon to furnish the necessary increase in prime moving force to power our economy. In like manner natural gas, because of the versatility of hydrocarbon conversion processes and of the wide variety of chemicals which can be made from its constituents, is of growing importance to any region so fortunate as to have reserves of this valuable resource. According to G. H. Smith,¹ Assistant Managing Director, American Gas Association. Natural Gas in 1949 supplied 19.4% of all energy used in the United States. This figure is almost double the percentage of natural gas used in 1937 and is a 6.1 over-all increase over 1947. Keith W. Johnson,² Industrial Economist, Federal Reserve Bank of Dallas, Texas, in commenting

1 - Smith, George H. Transportation, Storage and Peak Load Supply of Natural Gas - Fourth World Power Conference, London, 1950.

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- 2 - Johnson, K.W. The Natural Gas Industry of the Southwest and Its Significance to Industrial Development, Monthly Business Review, March 1, 1949.

on the natural gas industry of southwestern United States and its significance to industrial development stated:

"Natural gas has contributed significantly to the industrial development of the southwest and should play an important part in the further growth and diversification of industry within the region." - - - "The conservation of this resource, its utilization within the area and elsewhere, and the extent of its potential contribution to the industry of the area are of important concern to the economy of the Southwest."

Accurate estimates of population growths are difficult to ascertain. However, an examination of recent trends in population growths have shown that the decennial rate of increase, 1940-50, in the United States was about 15 per cent, not much less than it had been in 1910-30 and more than double the rate in 1930-40. In consideration of this and other evidence, Davis estimates an increase from the present population of about 150 millions to at least 200 millions by the century's end. The population of Canada is also growing at the rate of about 1 1/2 per cent per annum, and since our saturation point must be more distant than that of the United States, it seems not impossible that this rate may be maintained during most of the remainder of this century. Even assuming some tapering off, a population of 25 millions

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by the year 2000 should not be too much to expect. The rate of growth in Alberta, with its extraordinary industrial potential, should be greater than that of the country as a whole. Altogether it would seem unwise to allow for the requirements of less than double the present population in Alberta.

(Go to page 103)

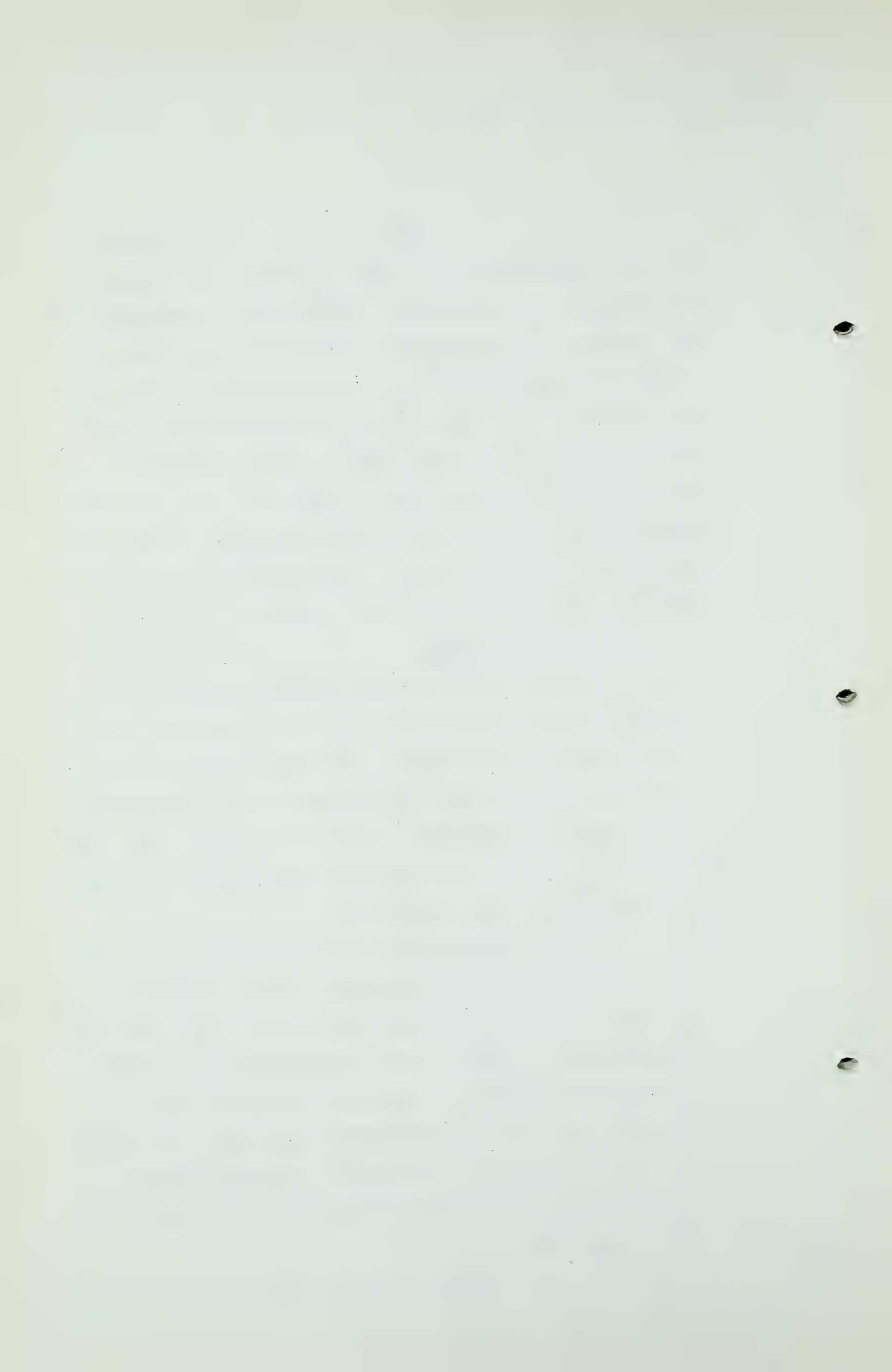
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That is the end of the introduction. The Report is divided into really six sections. The Introduction; Natural gas, constituents, properties and interfuel relationships; a section on Natural Gas as a source of power; a section on Natural gas as a chemical raw material. The fifth section is Liquefied petroleum gas, and the sixth section, Natural gas in relation to industrial growth in Alberta. I think, sir, if I read the summary, that will give us the main highlights of what has been included in this report. The summary is included in the first three pages. It is not numbered.

Summary

1. Alberta's potential industrial development is probably greater than that of any other Canadian province because of its reserves of energy in the form of coal, oil, natural gas, bituminous sand and hydropower; its deposits of limestone, shale, clay, sand, salt, etc., and because it is a rich agricultural province well able to support a growing population.
2. Canada's population is now increasing at the rate of about 1-1/2 percent per annum. Thus a population of 25 million people for Canada by the year 2000 should not be too much to expect. The rate of growth in Alberta with its extraordinary industrial potential should be greater than that of the country as a whole. Altogether it would seem unwise to allow for the requirements of less than double the present population of Alberta fifty years from now.
3. Generally speaking, natural gas is cheaper than



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either coal or oil for the production of heat and power. The prices of both coal and oil have increased in recent years largely because of the rising costs of labour. In addition to the lower cost of gas, its use is favored by convenience, cleanliness and efficiency of utilization.

4. The need for conservation from wastage of liquid petroleum gas (L P G) separated from wet gas in preparing dry gas for export, is emphasized. Propane and butane are the most valuable fractions of wet natural gas for the production of organic chemicals. They can be used also as a fuel for heat and power, and in internal combustion engines. The present market for them in Alberta is limited but the liquefied petroleum gas industry in the United States is developing very rapidly.
5. Developments in the petrochemical industry have been so rapid in recent years that it would be well nigh impossible to predict what new developments may become economically feasible in Alberta in the next ten years, let alone the next fifty. Sustained research, resulting in technological improvements, will continue to turn laboratory curiosities into everyday products and will continue to transform uneconomical and marginal processes into profitable ones. The two most promising processes for Alberta at present appear to be decomposition of dry natural gas to form carbon black, and partial oxidization of the butane fraction to form oxygenated organic chemicals.

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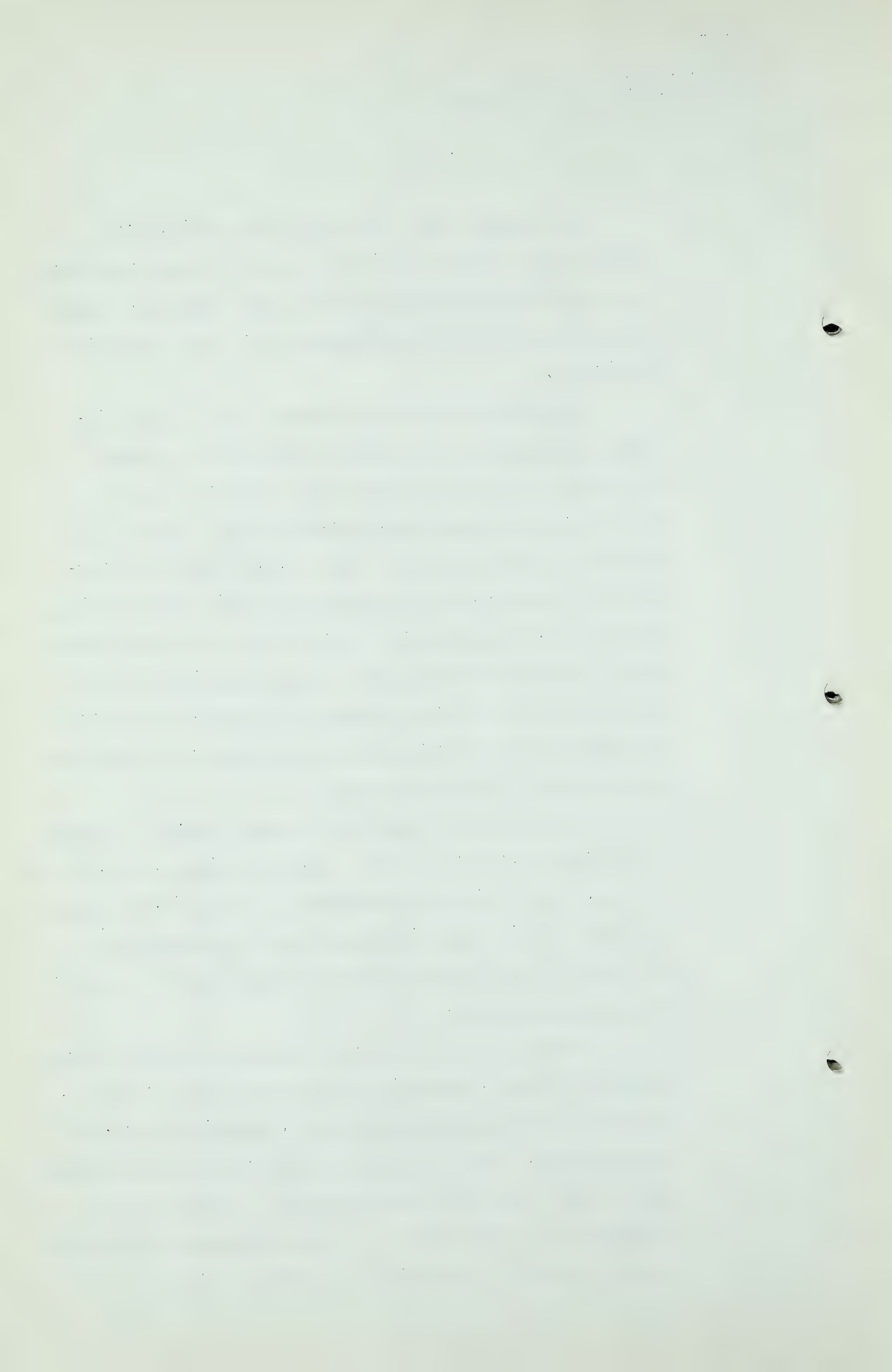
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Dry natural gas, the main raw material for carbon black, is also an ideal source of cheap acetylene, cheap synthesis gas and possibly cheap ethylene. These gases themselves are raw materials for other synthetic chemicals.

6. Agents for converting natural gas to power include gas engines, gas turbines, and steam turbines either with or without waste heat recovery. Best efficiencies are generally secured by gas engines up to 1500 KW and steam turbines 1500 - 15,000 KW. Gas turbines at present will be competitive with steam turbines at about 15,000 KW but for larger sizes the steam turbine only is available at present. Steam turbines require large quantities of cooling water whereas the gas turbine will require only about one-third the water required for the steam set of the same output.

The generating capacity of power plants in Alberta utilizing natural gas as fuel, was approximately 13,000 KW in 1949, but it will be increased to nearly 70,000 early in 1951. The increase is largely due to conversions at the Edmonton and Lethbridge power plants and of a number of government plants.

If 50% of the total 1949 consumption of electrical energy in Alberta, amounting to over 868 million KW Hr., had been generated from natural gas, assuming 20 cu.ft. to one KW Hr., then the amount of gas consumed would have been of the order of 9 billion cu.ft. Growth of gas consumption to this level for power generation in Alberta is quite possible and should be provided for.



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7. Because natural gas will be used both as a fuel and as a raw material, it seems safe to assume a rate of increase of natural gas consumption higher than either the rate of population or industrial growth in Alberta. Its use as a chemical raw material could represent immense quantities. For example, the Alberta Nitrogen Co.'s Ammonia Plant uses 1/4 of the natural gas used by the City of Calgary.

It is suggested that the industrial activity of the province will be at least doubled and possibly tripled in the next 50 years. Likewise the consumption of gas will increase to two or three fold, possibly fourfold, of the present consumption because of its multifold uses, cheapness, and convenience.

Q MR. C. E. SMITH: Is there anything you want to draw the Board's attention to, Mr. Lang, in the text?

A I don't think so, Mr. Smith. The text has been submitted.

CROSS-EXAMINATION BY MR. FENERTY:

Q Referring to that last paragraph of Paragraph 5 of the Summary, that 'Dry natural gas, the main raw material for carbon black is also ideal for other uses. Elsewhere, I think there was reference to liquefied petroleum gas such as propane and butane and so on?

A Yes.

Q Are the elements you refer to there at the end of 5 the same elements, could you use the residue gas after propane and these other various elements have been extracted, for carbon black and so on?

W. A. Lang,
Cr. Ex. by Mr. Fenerty.

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A You could use them, although natural gas is a better material to use for carbon black.

Q It would still be commercially practical to use it and still use the propane for proposed chemical industries apart from this?

A I did not get your question.

Q It would be possible to use what I call the residue gas, after the propane and butane have been extracted, for the chemical industries we refer to here?

A For the other chemical industries?

Q Yes?

A Yes, it would be.

Q There is no doubt that in using propane and butane extracted from gas that is going to be used for space heating, with the big fluctuation in production - and my understanding is that the chemical industry requires ample and a long term supply, a very steady supply, source of supply, and it would not be possible to provide adequate storage, even with the great compression for your requirements, would you agree with that?

A Storage is definitely a problem with propane and butane in large quantities for continuous use. It can be stored.

Q Yes?

A It is not an easy matter because of pressures.

Q What I am wondering is whether a combination of these other things, such as propane and butane, for carbon black and these other things would use up practically the entire raw gas with the result of a big steady supply for that alone, independent of any dependence of the gas produced

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Cr. Ex. by Mr. Fenerty.
Cr. Ex. by Mr. Steer.

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as a source for space heating?

A I would not want to make any commitments.

Q You think I am getting too far in the future?

A I think so.

Q Well, we are very interested in the future. You know that, and that is why I want to call your attention to this. It seems to me it might be one of the main sources of power requirements, new power requirements, in the future in Alberta. You know we are drilling a great number of wells and we are approaching the position where the production from these wells is based on pumping, and that will necessarily increase and I wonder if you have given any consideration to what might be a great power requirement for pumping, a great number of wells in the future?

A We have indicated that the power requirements are likely to increase for various reasons.

Q But you did not give thought to that form of power?

A We did not give any thought to that.

Q I was wondering if you had, because I think you may have a great power requirement there. But the report does not go into that in detail?

A It does not go into that.

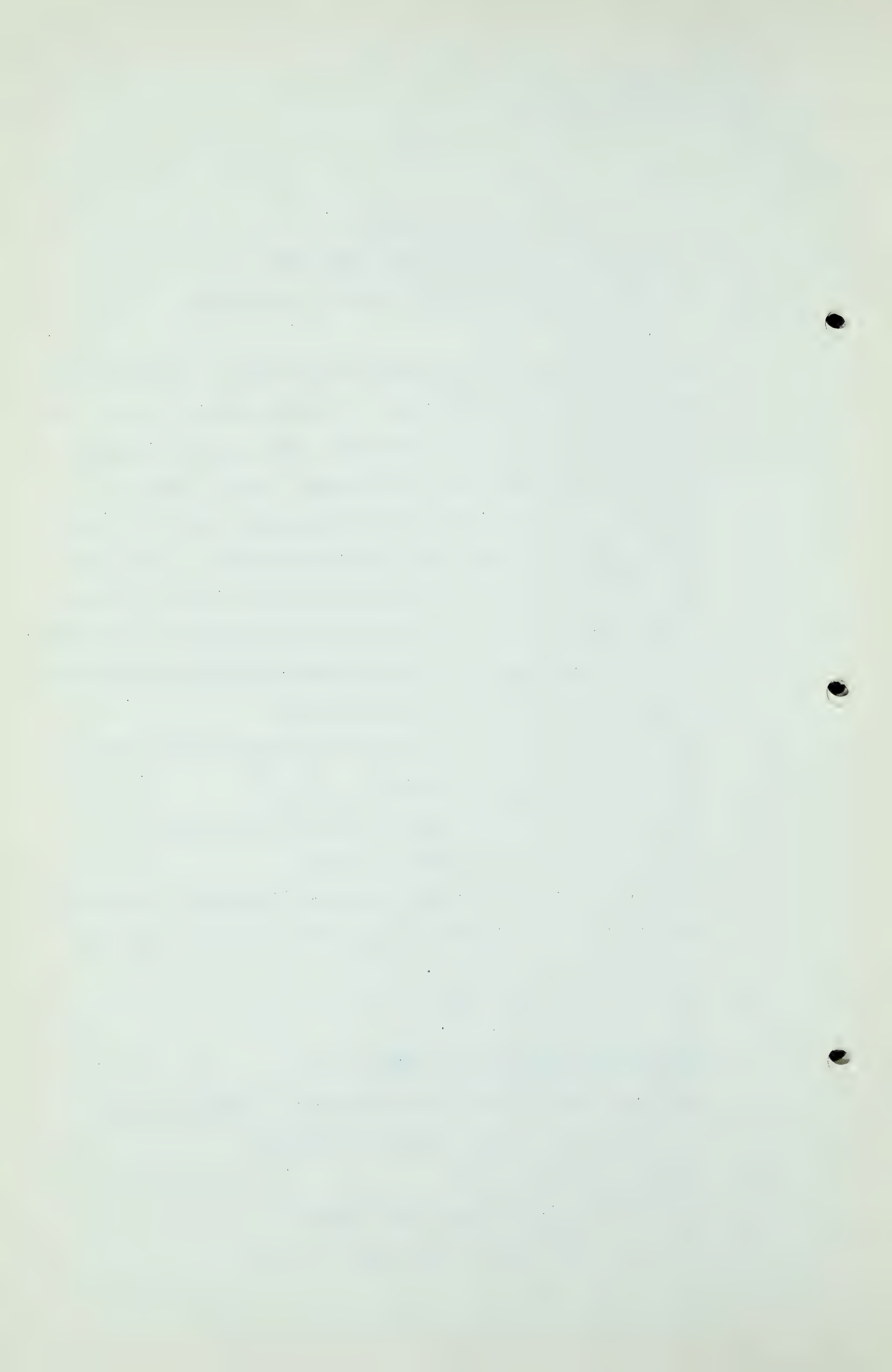
CROSS-EXAMINATION BY MR. STEER:

Q Has any thought been given to the use of natural gas in connection with atomic energy development?

A Not that I know of, sir.

Q That is not dealt with in your report?

A It is not dealt with in my report.



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Cr. Ex. by Mr. McDonald.

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CROSS-EXAMINATION BY MR. McDONALD:

- Q Would you be good enough to illustrate how you use these Monograms you have on page 7 and again on page 8?
- A This use of these monograms really is very simple. All you have to do is put a straight edge - shall we take fuel value of oil per gallon. You will notice the point there, 180,000, through the cost of oil per gallon, which is given as 10 cents, and you reach the cost of fuel as purchased in dollars per million BTUs, approximately 0.54 cents. And that will give you the cost of fuel as purchased. But that does not mean that efficiency has been taken into that picture. Therefore, the monogram which follows in Figure 2 provides for the efficiency. In the central column you have the cost of fuel as purchased, dollars per million BTUs. You have on the left-hand side efficiency percent and on the right-hand side, you have cost of fuel as utilized in dollars per million BTUs. Now all you have got to do is put a straight edge across, as is shown there. 65% efficiency through .55 and you get the cost of fuel as utilized, dollars per million BTUs of .85, or that approximately. It is just a quick and rough method of getting the values of either cost of fuel as purchased per million BTUs or cost of fuel as utilized per million BTUs.
- Q You realize, Mr. Lang, what we are interested in here is the effect of the pipe line industry on the industry of the Province as a whole. Have you read exhibit 77 which was filed in the Westcoast Transmission submission to this Board?
- A I have not.

W. A. Lang,
Cr. Ex. by Mr. McDonald.

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Q I have got a copy of it here and maybe you could follow it with me. And can you tell me whether you agree or disagree with the conclusions that are therein expressed? I am reading from page 1281 of Volume 17 of the Westcoast Transmission Hearing.

"Summarized Conclusions

(a) From consideration of numerous available data it is concluded that natural gas in itself is not a particularly important factor in the attraction of industry to an area, but that industry may be attracted by oil and products associated with natural gas."

A I would say natural gas in combination with other natural resources, and as I pointed out in the introduction, Alberta has other natural resources which are of interest, in addition to being an agricultural province.

Q MR. C. E. SMITH: Would you say these might attract industry?

A Yes.

Q You did not finish up the sentence, I do not think.

Q MR. McDONALD: You have pointed out in your own submission that the predominant elements in attracting industry are raw material, labour and one other thing, markets?

A I gave others as well where raw materials are abundant, where labour is in adequate supply and markets for the product are available.

Q Yes.

A I am sorry, I should have included one other. "Industrial development will be greatest in those areas in which energy

W. A. Lang,
Cr. Ex. by Mr. McDonald.

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may be most economically produced and efficiently used."
That is a very important point.

Q Now let us go to (b) in Exhibit 77 again. You have it there. This has to do with the State of Texas and the conclusion in Exhibit 77 is:

"In Texas the largest gas-producing State in the United States, the industry associated with oil and gas is largely based on the use of refinery gases and liquid components extracted from natural gas with the production of large quantities of merchantable pipe line gas as a by-product, except in the case of carbon black."

Are you familiar enough with the industry in Texas to comment on that conclusion?

A It is my understanding that the majority of carbon black that is made in the State of Texas is from dry natural gas.

Q Yes, but this conclusion excepts carbon black?

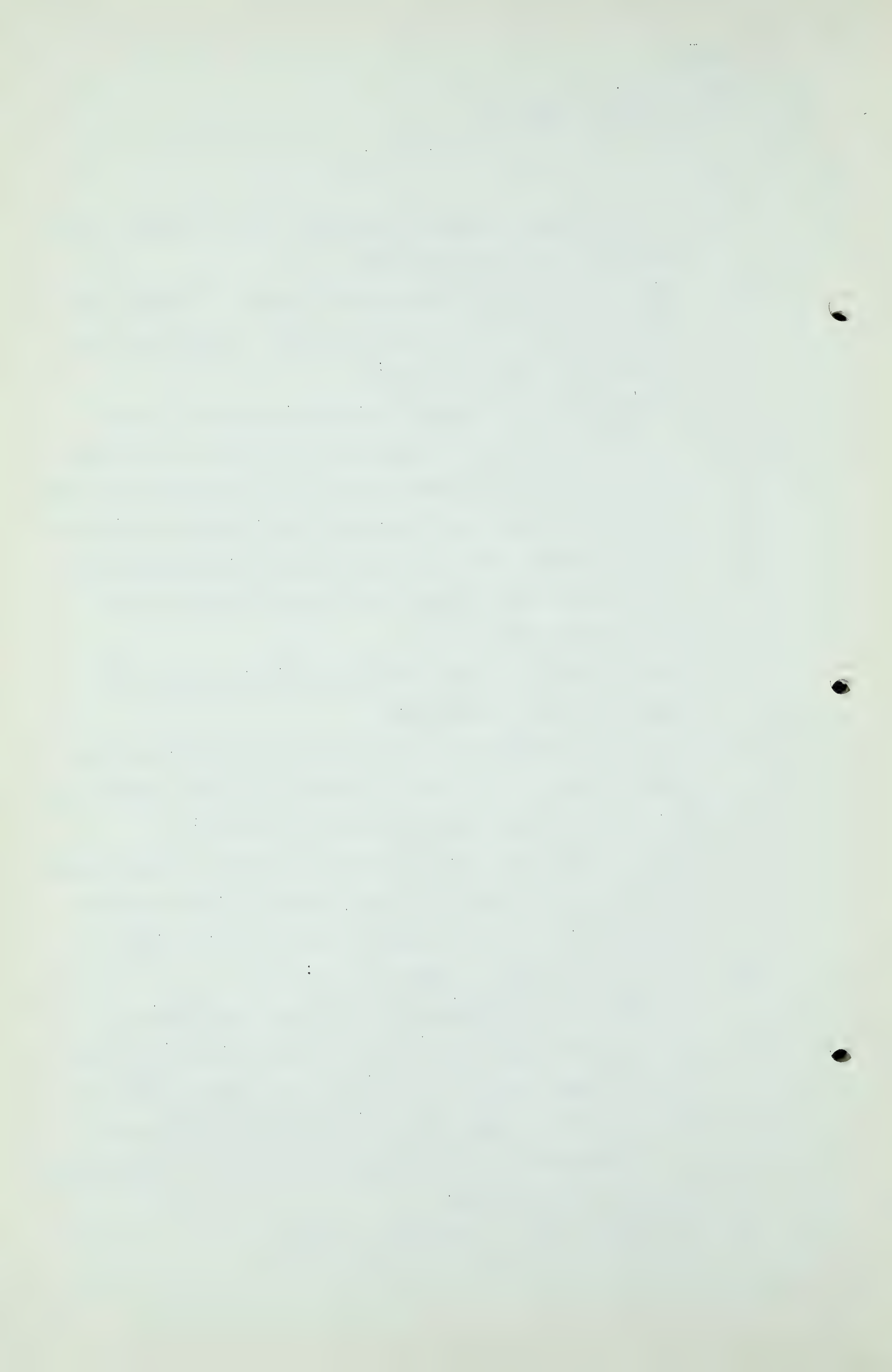
A Yes, and that the chemical industry uses to a large extent the liquefied fractions of wet natural gas plus similar components which can be taken from the refinery gas.

Q Yes. Now we come to conclusion (c):

"Prior to the application of strict conservation measures large quantities of merchantable pipe line gas were wasted and now with conservation measures in force a large part of the industry in Texas is dependent for raw materials upon export of natural gas."

Can you comment on that?

A I would not care to comment on that.



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Cr. Ex. by Mr. McDonald.

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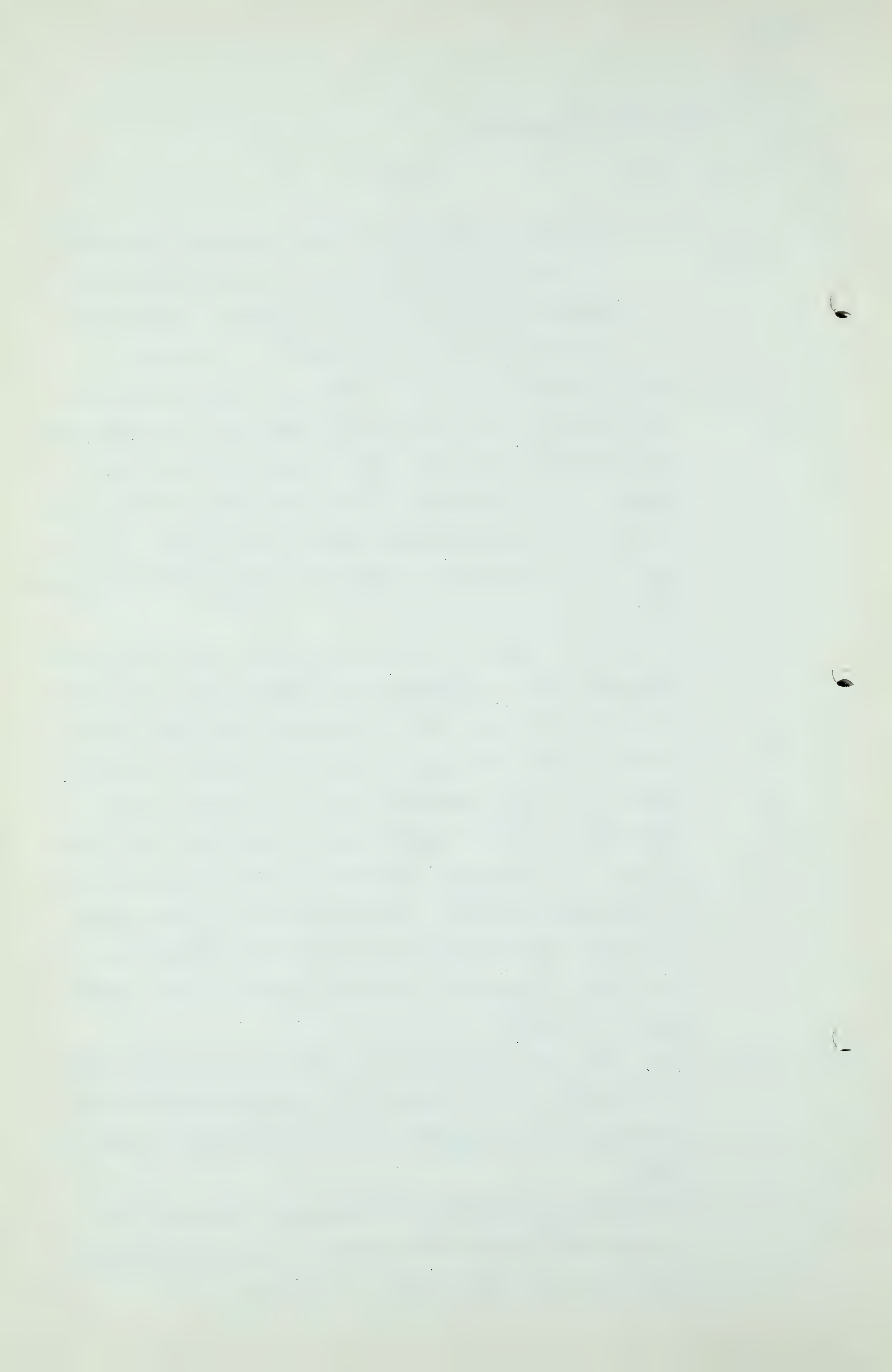
Q "(d) In the interests of conservation an industry dependent on by-products from raw gas can not be permitted to develop unless there is a market for the merchantable natural gas as a by-product."

Can you comment on that? I think if I might elaborate a bit, Mr. Lang, the point there is made that the butane and liquified petroleum gases are the main essential raw product for the industry, at the same time if there is not a market for the merchantable pipe line gas then you can not get your essential raw material and liquified petroleum gases.

A On the other hand, if we should consider it in this light, supposing that raw natural gas is utilized entirely, what is going to be done with the liquified petroleum section, liquified petroleum gases, propane and butane, and in my opinion, if those are wasted, you are wasting a very important potential reserve and a reserve for which there may not be an immediate market at the moment, and I think in the submission here I have mentioned that the market for liquid petroleum gases in Alberta is limited but is a potential, but that the potential future of those gases may be very great.

Q Yes. Well now, don't you think that you have approached the problem from one side and the submission which I am referring to here, Exhibit 77, has approached it from the other?

A I have only the summarized conclusions here and I feel a little bit hesitant on commenting on this considering what might be in the text of the submission 77.



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Q Well, I do not want you to comment any more than you feel like doing at this time, but the point I want to make with you, and see if you agree with me, is this, that if you are going to have the industries which are associated with liquified petroleum gases you have got to have export to produce them. On the other hand, if you are going to have exported gas you are going to have liquified petroleum products which are available for industry if industry wishes to come and use them. They both go together, they are a team that can not be separated.

A Or use within the Province for that gas. I think the word "export" there is not used in the correct sense.

Q There has got to be a market for the gas?

A I agree with the statement there should be a market for the gas but I do not agree there should be an export market for the gas because I think that is an incorrect statement.

Q You think it is what?

A I think it is an incorrect statement to say that there would have to be an export market for the dry natural gas.

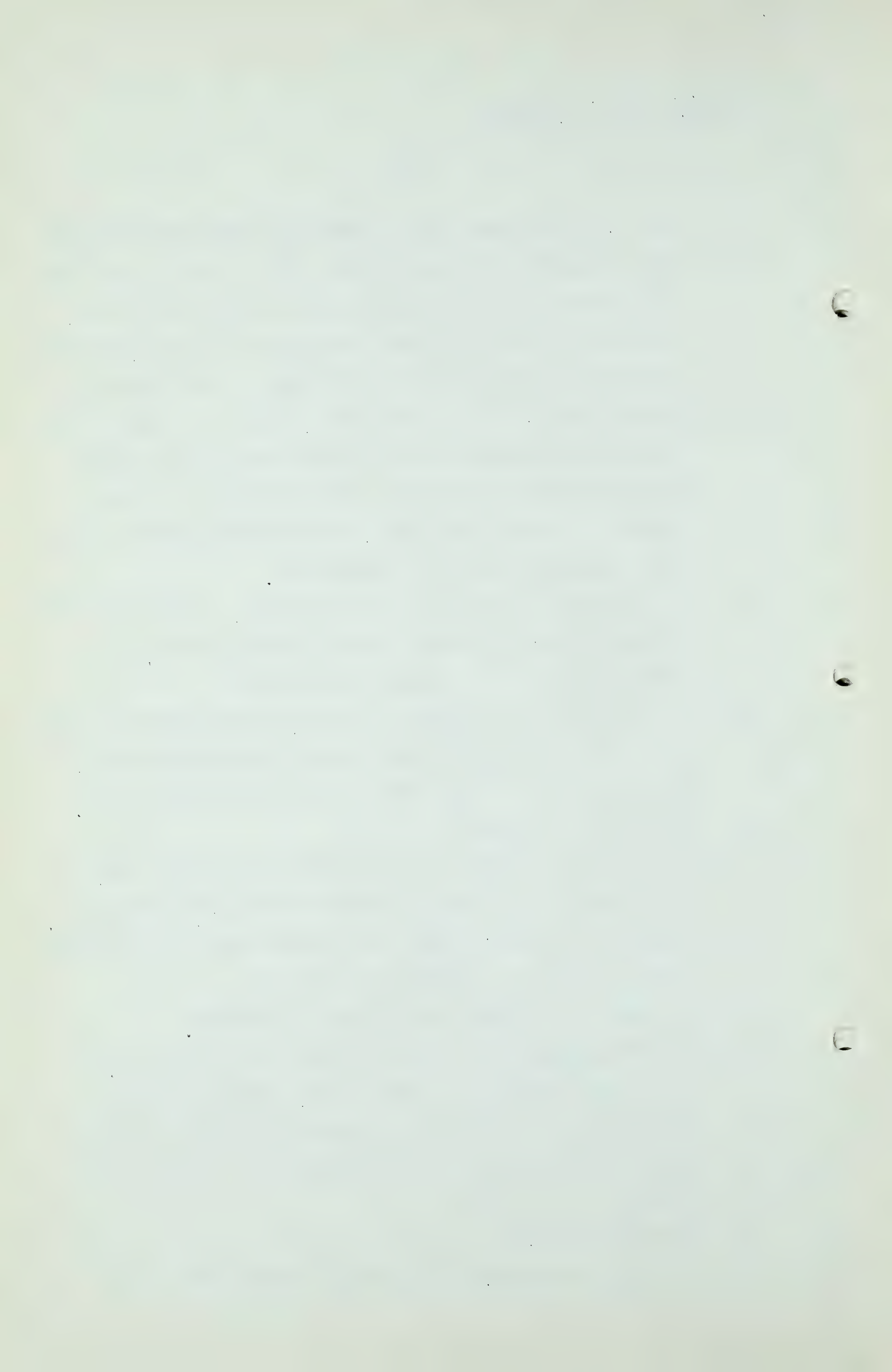
Q Instead of saying "export" there would have to be a market either within or without the Province?

A I would say at least there should be a market.

Q I won't quarrel with you about that, the place of it. Now, there was just one other point. Have you given consideration to the use of natural gas in the United States in your study and preparation for this particular paper?

A In what respect?

Q In the distribution, of the use of natural gas in the



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United States where it is consumed?

A I think it was given in a previous submission here. It is not included in this one particularly. There is one chart which indicates the consumption of liquid petroleum gases in the various sections. That is Figure 3.

Q Well, I refer you to the extract from the report of the Federal Power Commission and the section of the report is that of Commissioners Smith and Wimberly. You might tell me whether you can comment on this statement. I am reading from page 1286 of the Westcoast transcript. You are familiar with the report of the Federal Power Commission?

A Yes, I am familiar with that.

Q On the natural' gas industries?

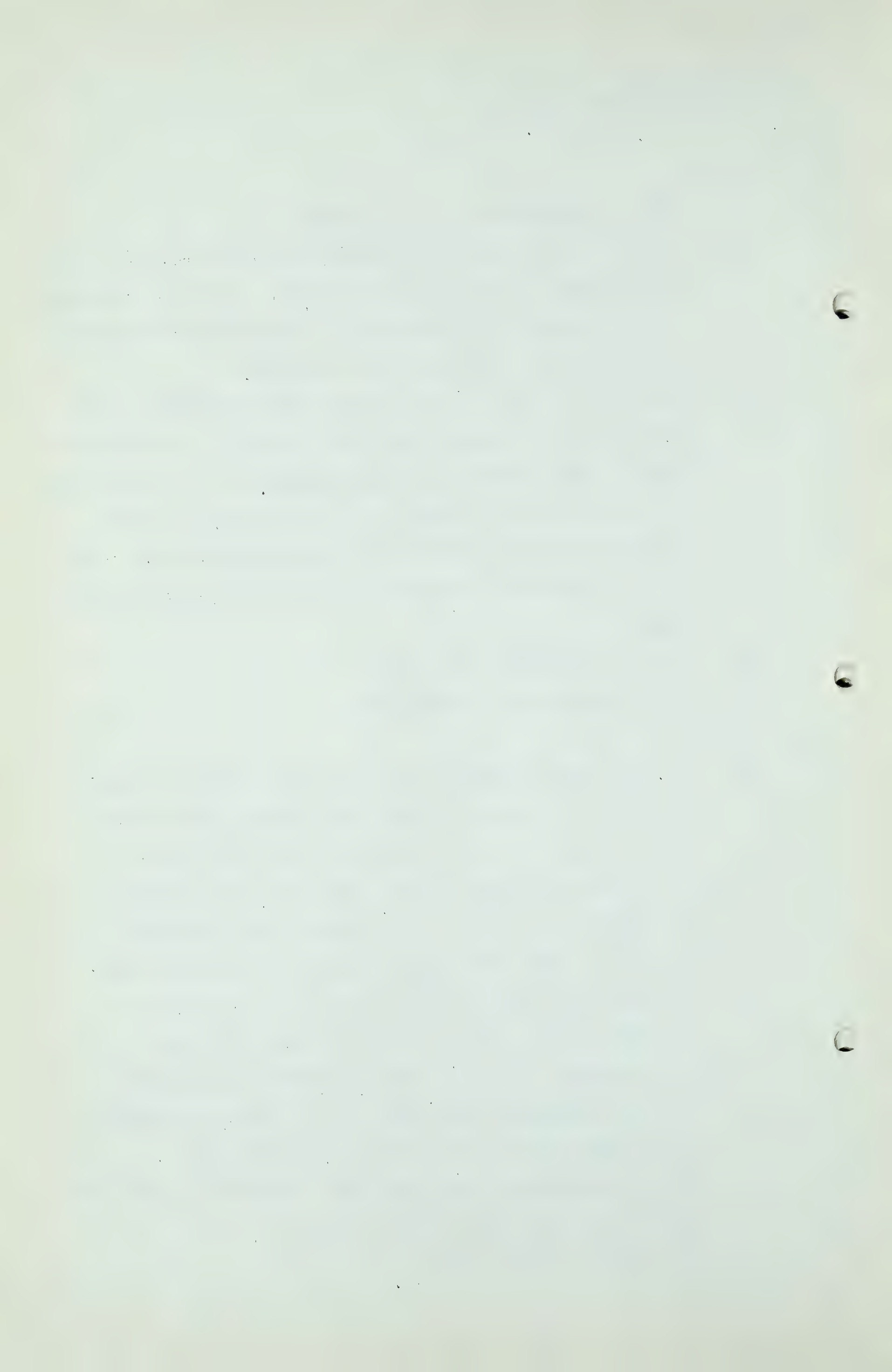
A Yes.

Q In this report Commissioners Smith and Wimberly state:

"About 35 per cent of all the natural gas consumed is used in oil and gas-field operations and in producing carbon black. Such use, which occurs within or close to the producing and gathering field, does not require pipe line transportation. The other 65 per cent is 'pipe line' gas, but most of it, too, is used relatively near the sources of supply. Total interstate movements in 1945 were 28 per cent of the total gas marketed and 43 per cent of the 'pipe line' gas."

Now, commenting on that particular statement, I draw your attention to the 65% as pipe line gas.

A Used close to the source.



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Q But much of it, too, is used relatively near the source of supply?

A That is in Texas.

Q That is in Texas, yes.

"Total interstate movements - - "

which would be the type of export we are talking about here -

" - - in 1945 were 28 per cent of the total gas

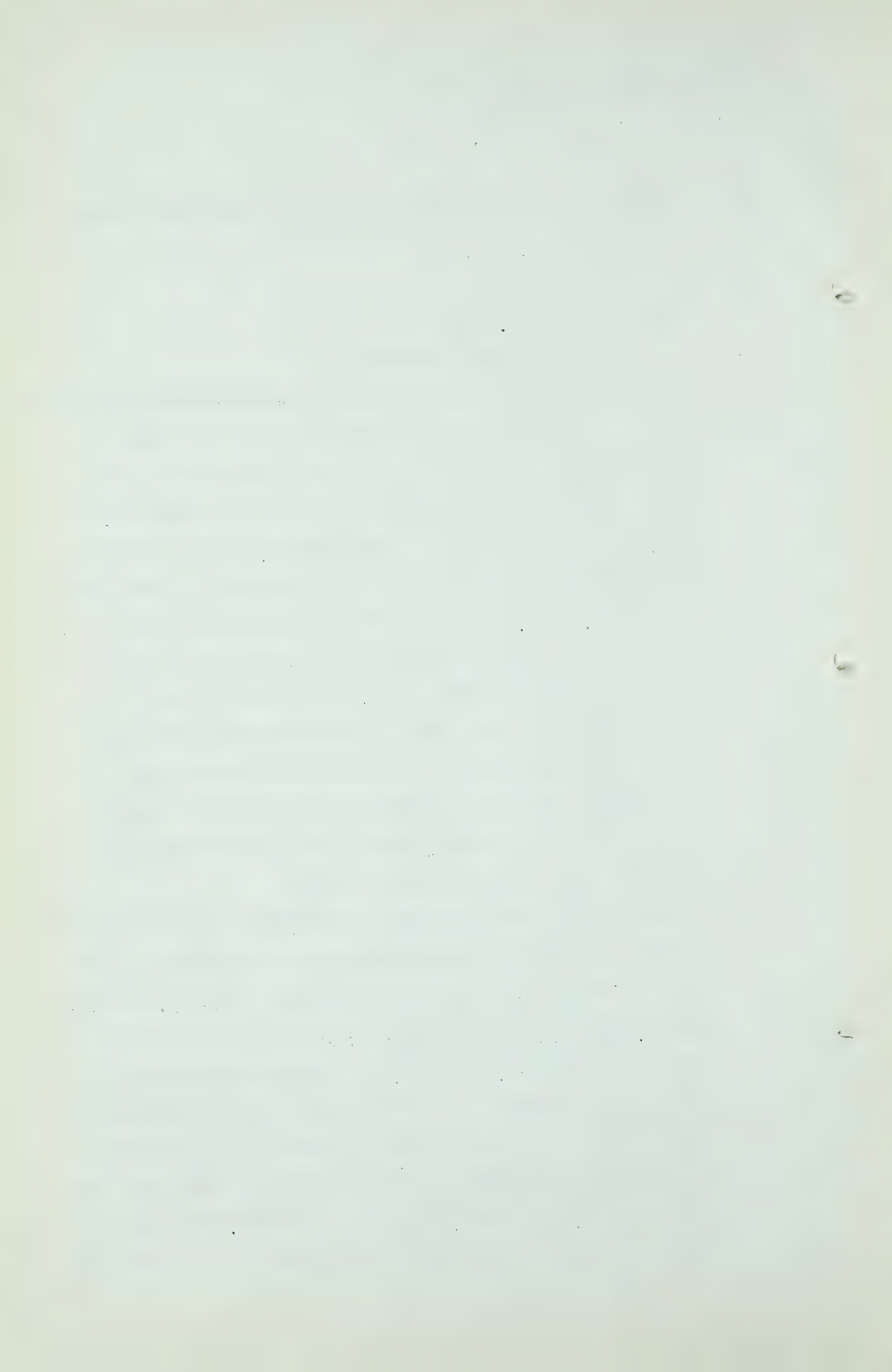
marketed and 43 per cent of the 'pipe line' gas."

Now, the point I wish to make with you, that this statement of 65 per cent is used relatively near the source of supply. Now, I interpret that statement to mean that:

"65 per cent of the industrial natural gas used was delivered from producing areas by pipe line to industrial areas. In the Southwest these industrial areas are concentrated along tidewater where the advantage of water transportation to market places the Southwest United States in an entirely different position than that of Alberta."

Have you any comment to make on that?

A I realize that Alberta is not as strategically situated as Texas is and that transportation may be a factor. It depends, however, upon the final value of the product that you are making and, secondly, it depends upon whether or not you can bring to Alberta sufficient population to utilize the products of industry, and in the introduction I pointed out that the growth of population in Alberta, or at least, in Canada, is approximately 1.5 per cent and that the growth in Alberta can be anticipated to be a little bit more rapid than that because of the industrial



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potential of the Province. I think if you were to estimate the growth of our major cities where a major part of the population of Alberta is, that you would find that the growth over the last period has been greater than the amounts that have been suggested by me.

Q Well, I would just like you to comment on this too:

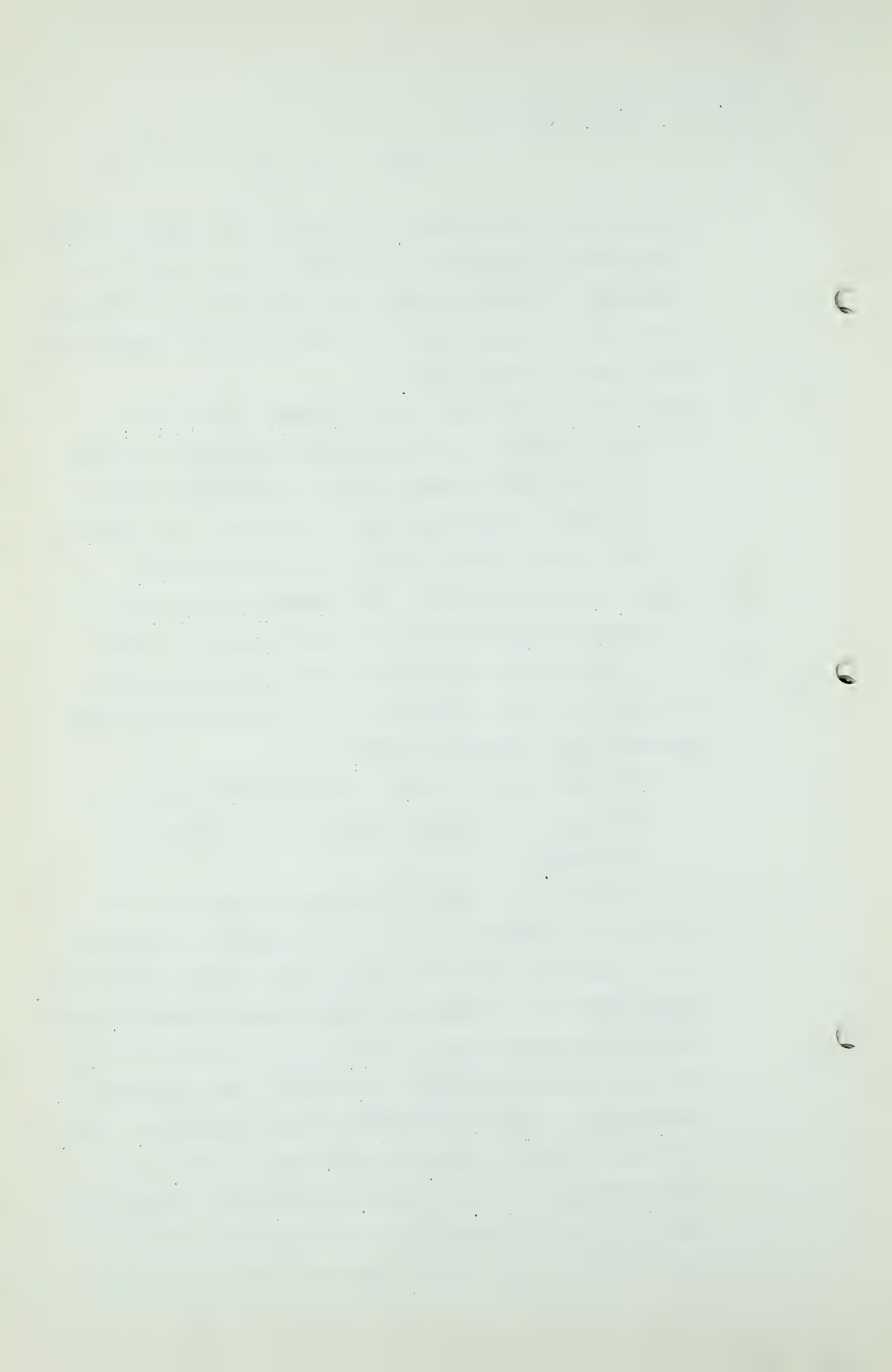
"As an example of these stifling influences the lack of industrial development in the Medicine Hat area should be cited where one of the lowest cost sources of natural gas has existed for over 40 years."

I mean, can you reconcile your submission today with the fact that Medicine Hat has had cheap gas for 40 years?

A If we have growth in population then the development at Medicine Hat will increase, as also indicated in the submission where I mentioned that:

"Not only will it attract new industries but it will also tend to increase production from present industries."

And I think we only have to follow the charts that are given under Section 6 here to see the growth in industry in the Province, and if you look at the fourth figure there, which shows the consumption of natural gas by manufacturing industries that follows page 55, you will see ever since 1932 there has been a rapid increase in the consumption of natural gas in Alberta by manufacturing industries. True, there was a drop in 1946, a slight drop in 1944, and a further drop in 1946, but the climb has been upwards again and the climb in the next year will be greater than it is now because we have already heard that some of the beet



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factories are likely to use natural gas. It is also indicated that the cement plant at Exshaw will likely use natural gas, and those would both be large industrial consumers of gas.

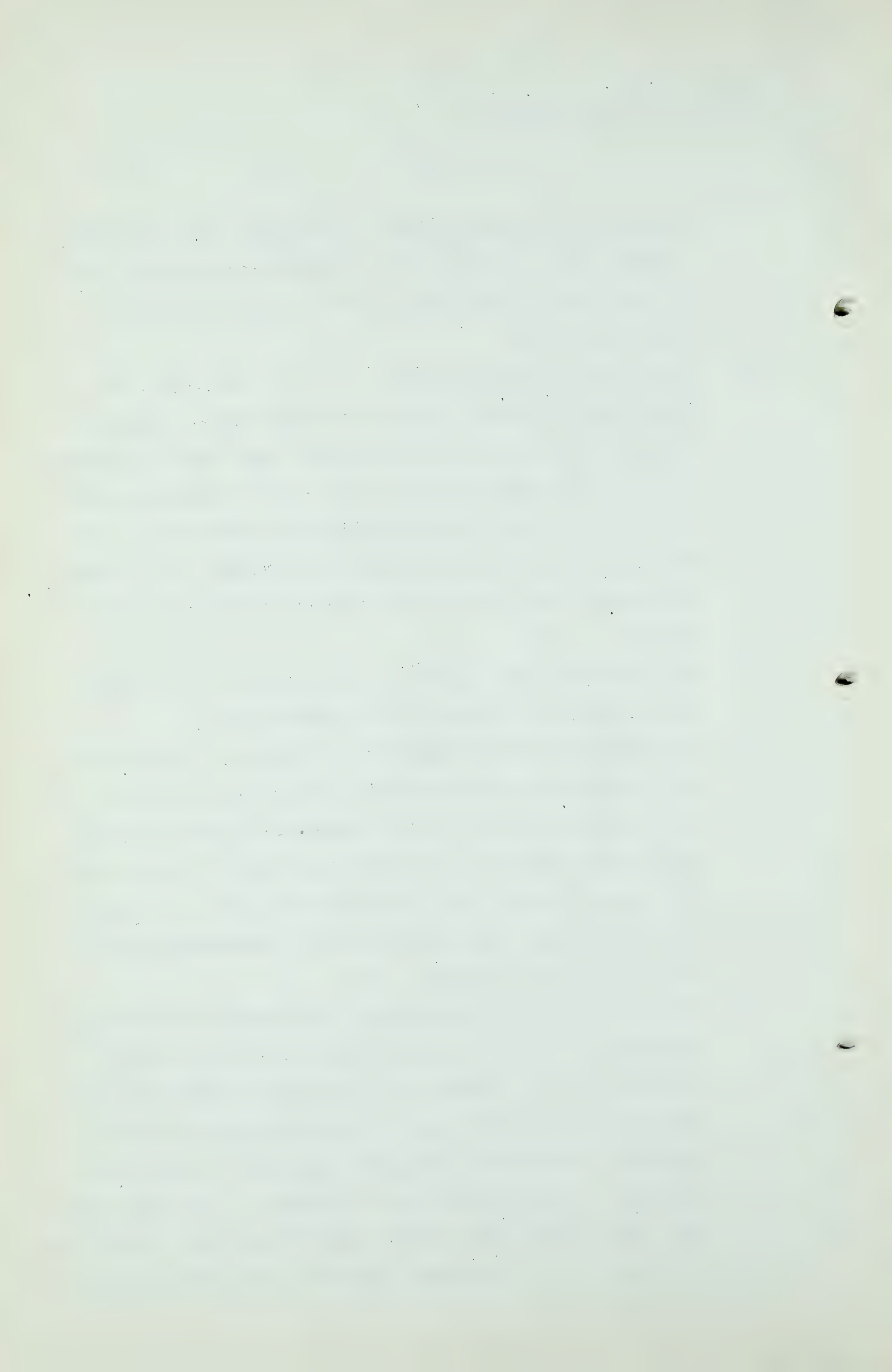
Q Now, there is only one fault I have to find with your statement, Mr. Lang, and that is this, that you have not divided that between industries that have been in existence for 20 or 25 years and those that are new industries that have come in since the population has increased, or that can be related to cheapness of natural gas. For instance, the Exshaw plant has been in existence for better than 30 years.

A But there was not a source of natural gas to the Exshaw plant, therefore it did not use natural gas.

Q And there have been industries in Calgary, I think, which have been added but the natural gas has been here for close to 40 years. I mean, is your statement entirely true in that these industries have been converted? They are not new industries that have been attracted, they are not new industries that have been dependent on natural gas, the great percentage of them?

A In the report I can not give you sufficient instances of industries that are coming to the Province but I have suggested in this submission that with the potential of reserves that we have here of energy and of other raw materials, that we may have new industries at any time.

Q Now, let us look at your chart on Figure 4 following page 55. Now, if you take it on a quantitative basis in billions of cubic feet your document where you have your increase



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from 1938 to 1942, isn't that the period in which the Alberta Nitrogen plant commenced operation? It was 1942 when it came into operation?

A I could not give you the exact date when it came in.

Q Would it be fair to say then that 3 billion cubic feet per year is the consumption of that plant and that accounts for practically all your increase, one half the increase between 1938 and 1942?

A It accounts for part of that increase, there is no question about that.

Q On the basis of your chart it would be one-half?

A Well, I mean, it is approximately one-half.

Q What I had in mind with regard to that is this. We all know the Alberta Nitrogen plant is one of the very few industries which is based on the use of methane as raw material, isn't that so?

A Well, there are other industries. The carbon black industry has been mentioned, and in the report it is suggested that Canada imports approximately 50 million pounds of carbon black yearly. That carbon black comes from Texas.

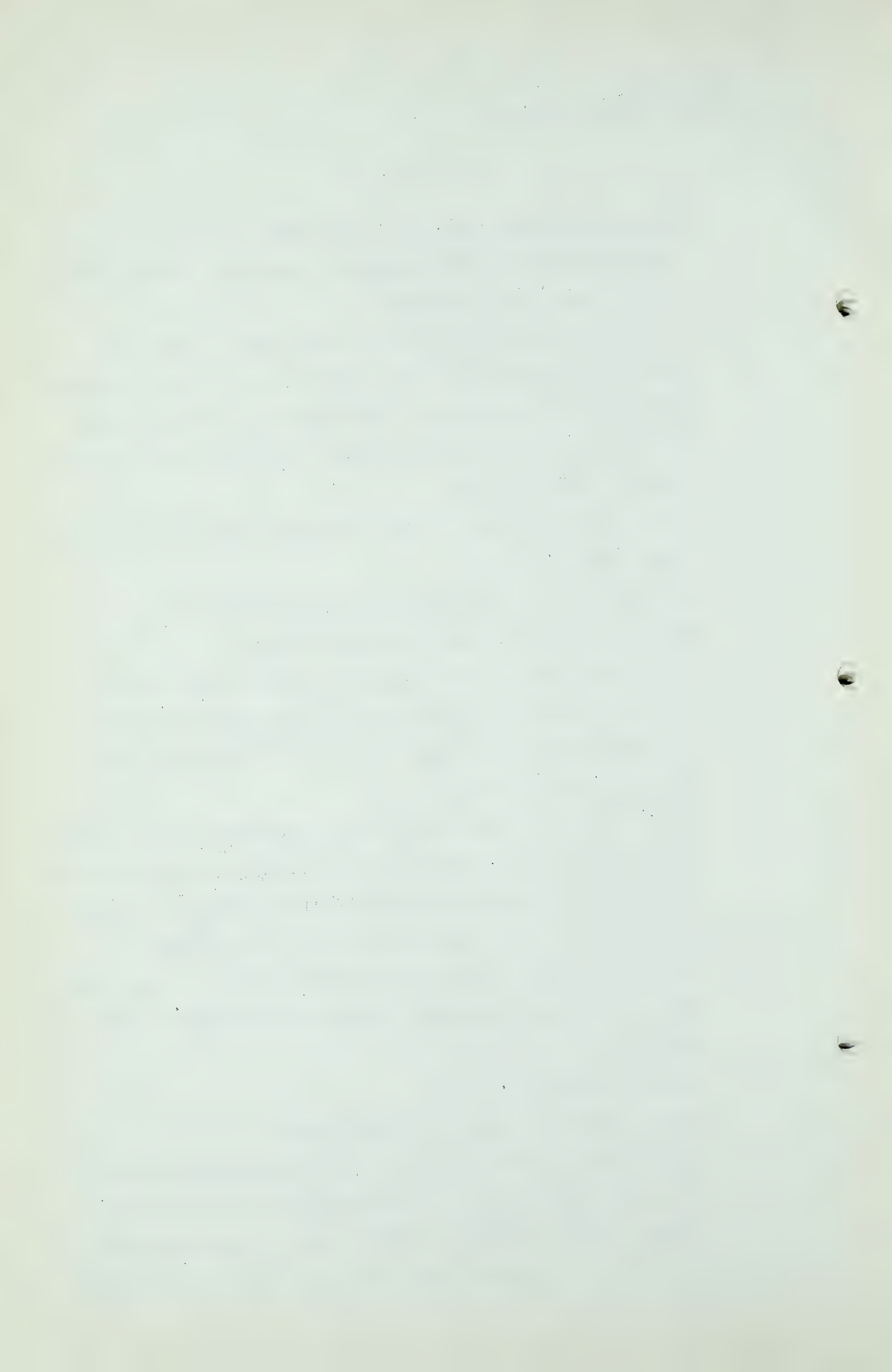
Q Well, just dealing with carbon black, don't you think that the carbon black industry is a specialized part of the natural gas industry?

A It uses natural gas.

Q And it must have very, very cheap gas?

A It is usually developed where there is cheap natural gas.

Q The only reason I say it is specialized is in the regulations of this Government carbon black is specifically dealt with as something that has to be dealt with subject



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to special application. As far as I know, there have been numerous considerations given to establishing it in Alberta ever since 1928 and I do not know of anybody that has got anywhere near a commercial project in mind, even at this late date.

A There is still research work being done on the development of better processes of conversion of natural gas to carbon black.

Q Yes. Have you gone into the economics of it? What price would have to be paid for it?

A I have not got that.

CROSS-EXAMINATION BY MR. NOLAN:

Q I was just going to ask you one question, if I may, Mr. Lang. You are a member of the Alberta Research Council, Mr. Lang, are you?

A I am secretary of the Alberta Research Council.

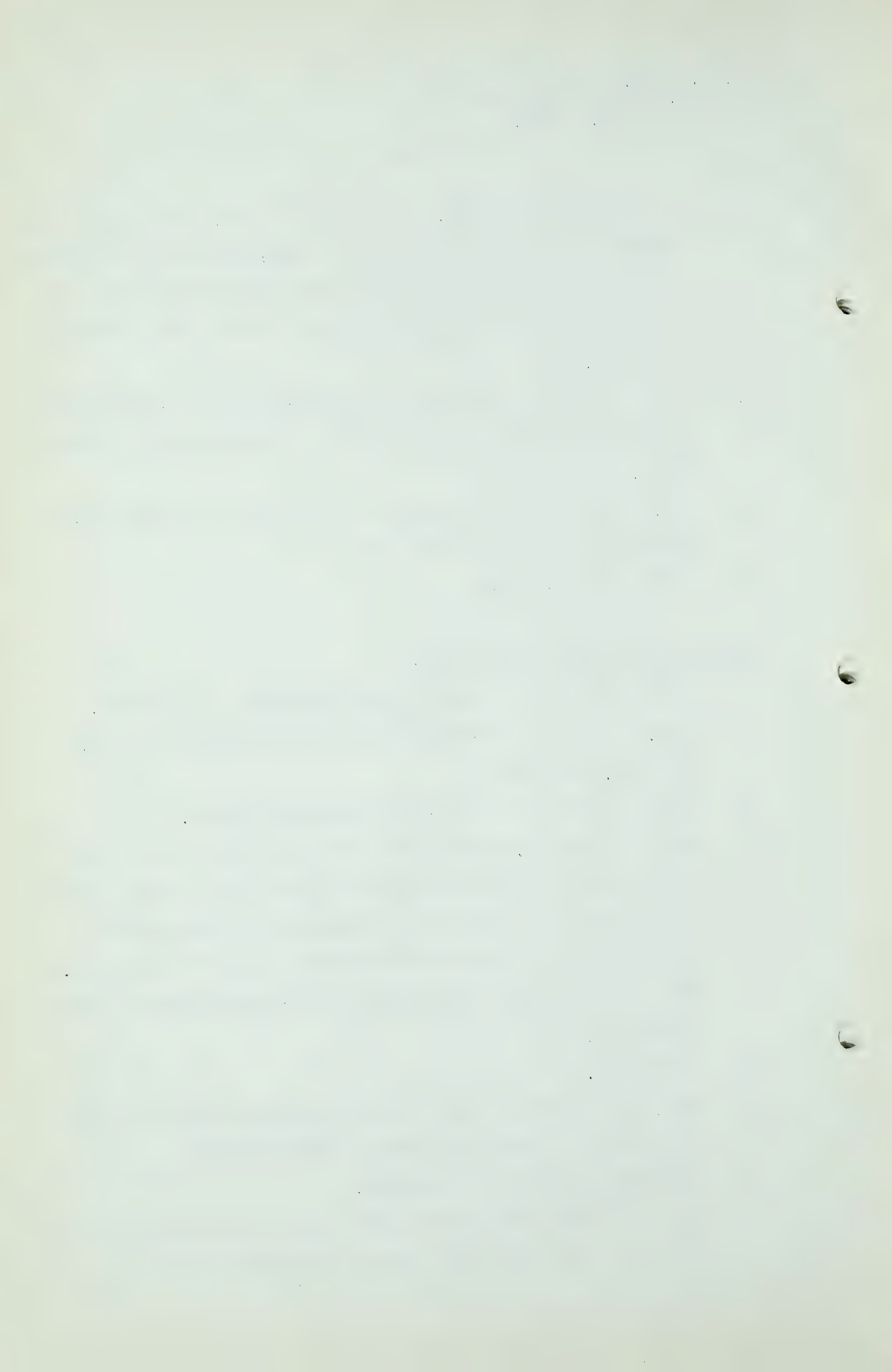
Q And you know, Mr. Lang, that within the last year or year and a half we have had a number of Sittings in this Province of the Board of Transport Commissioners and the Royal Commission on Transportation enquiring into freight rates. Have you dealt with the question of freight rates in your submission?

A I have not.

Q Well, you do know it has been a consistent effort of this Government to have those freight rates lowered?

A I think that would be desirable.

Q Well, perhaps your Council made some submissions to one or other of those two bodies when they appeared here?



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A No, we have not made any submissions.

Q Well, you do know that freight rates have been consistently getting higher in spite of our best efforts in this Province?

A Freight rates have been going up, I grant you that.

Q Yes, and you and I as residents of the Province realize that every day, don't we? Have you considered the effect of the present freight rate and the fact that freight rates are consistently increasing, on the development of industry in the Province?

A I have not included that in the submission.

Q But you perhaps have some views that you would be good enough to let us have?

A Since I am not an economist, I would prefer not to express an opinion because I know you can very easily get, shall I say, confused with different ramifications.

Q Well, I am not an economist either, Mr. Lang, and I am constantly confused, but I wonder if you would agree with me when I say that one of the reasons why industrial development in Alberta has been retarded is because of its geography and its attendant high freight rates?

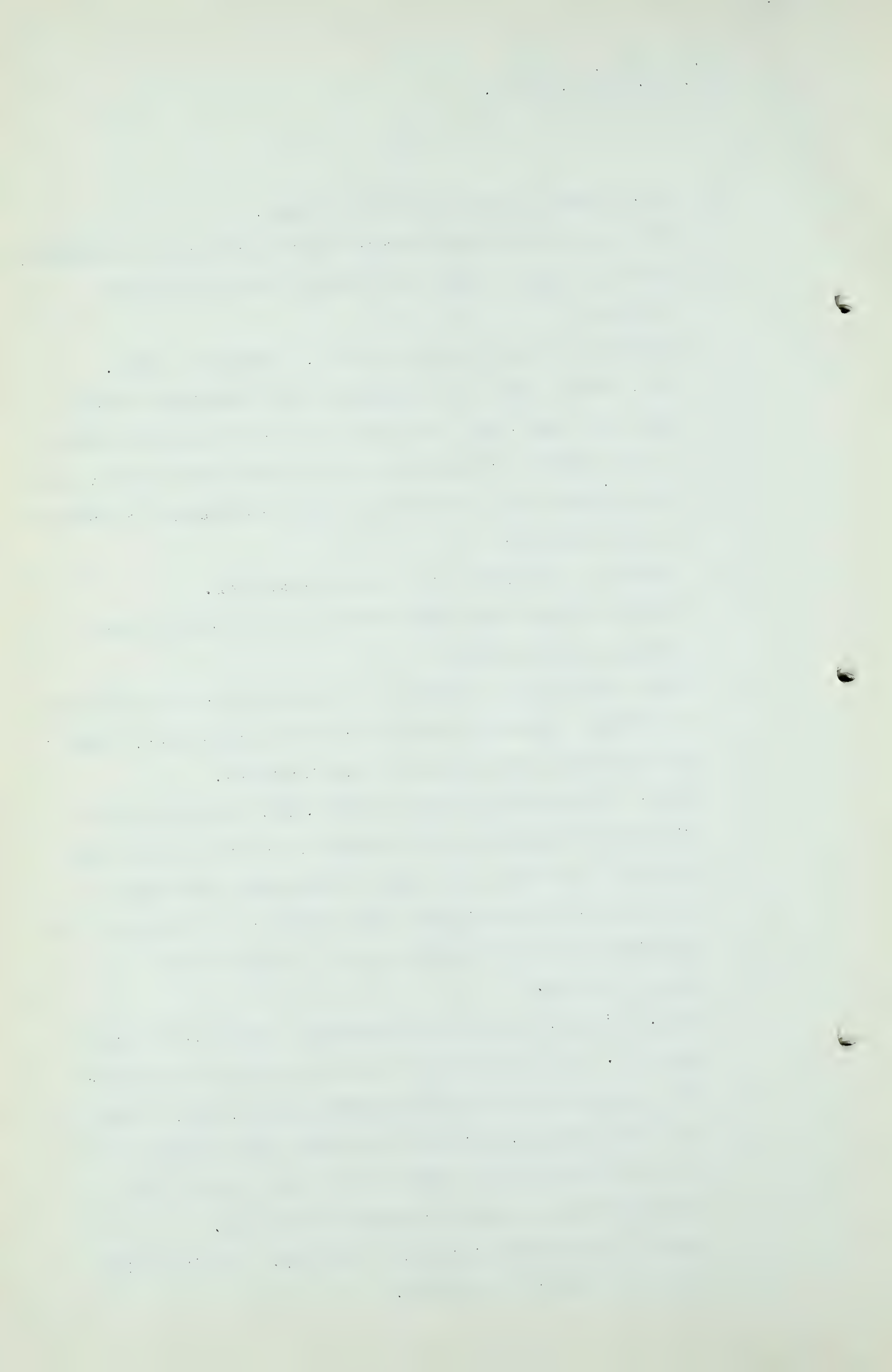
A It is a factor.

Q Well, will you say it is an important factor and I will leave it. Do you consider it to be an important factor?

A It is considered to be an important factor, yes, I will go that far with you, because if we had lower freight rates and if we had cheaper transportation as a whole, then naturally you can make a cheaper end product.

Q But the trend seems to be the other way, unfortunately?

A I can not predict the future.



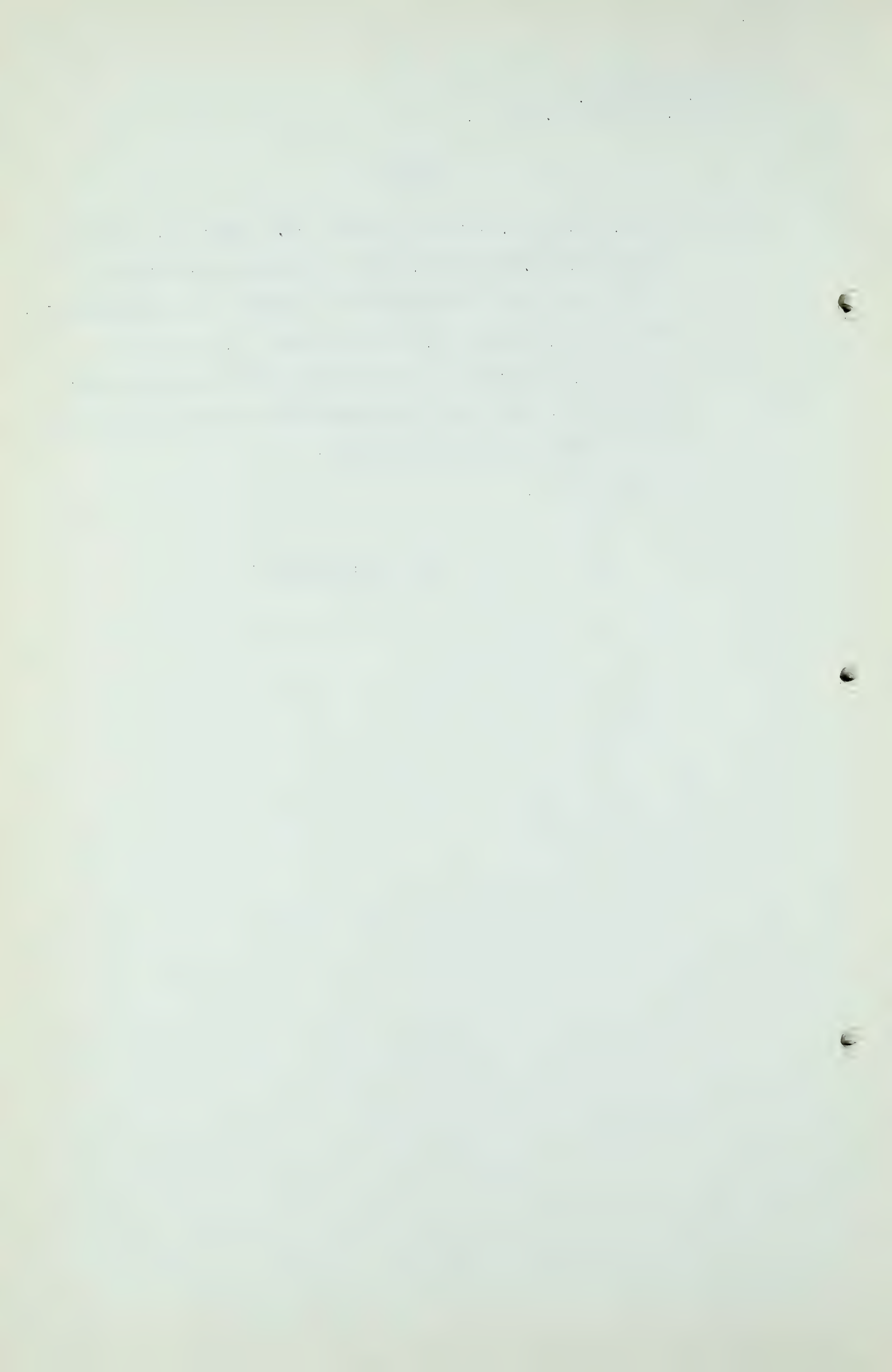
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Q Oh, Mr. Lang, I read your report. Mr. Lang, you told my friend, Mr. McDonald, that any increase in the use of natural gas would bring about an increase in population, and that, of course, we do understand, but there are certain manufacturers of high grade products made from butane and propane and that manufacture would increase the use of natural gas, would it not?

A I think so.

(Go to page 122)



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- Q And then you mentioned to my friend, Mr. McDonald, the question of carbon black, or he mentioned to you the question of carbon black and its manufacture. Is it a fact, Mr. Lang, that the manufacture of carbon black must always have cheap natural gas?
- A I made the statement that it was usually developed where there was cheap natural gas.
- Q Yes. And I am asking you whether it is not a fact that it must always have cheap natural gas to justify its manufacture?
- A I mentioned that there was research being done on new developments and some of these developments may affect the ultimate cost of the production of natural gas.
- Q But at the present time is it not a fact that carbon black is being manufactured only where there is cheap natural gas?
- A That is right.
- Q Right. And that when the price of natural gas went up to an uneconomic point, the plant moved away?
- A I cannot tell you that.
- Q You do not know anything about that?
- A No, I do not know anything about that.
- Q All right, thank you, Mr. Lang.

.....

CROSS-EXAMINATION BY MR. S.B. SMITH:

- Q Mr. Lang, I think you said a few minutes ago that the major portion of the population of Alberta was urban, or something to that effect. That is really not correct, if you said that?

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A A large percentage, if you take the population, the total of the population of Calgary and of Edmonton.

Q Yes?

A Those two cities alone?

Q About 250,000 altogether, I suppose, or thereabouts?

A Well, in that vicinity, yes.

Q And the population of Alberta is about what, 900,000?

A It is not 900,000.

Q It is not 900,000?

A No, or, at least, not to my knowledge.

Q So that the majority of the population of Alberta is still rural, there is no doubt about that?

A That is correct.

Q Now, Mr. Lang, I have no doubt that you have read the study prepared by Mr. Zinder that is referred to in the report of the Dinning Commission? You have read it?

A I have read the report of the Dinning Commission.

Q Well, you have not read Mr. Zinder's study entitled "Industrial Location and the Natural Resources", which is referred to at Page 79 of the report of the Dinning Commission?

A No.

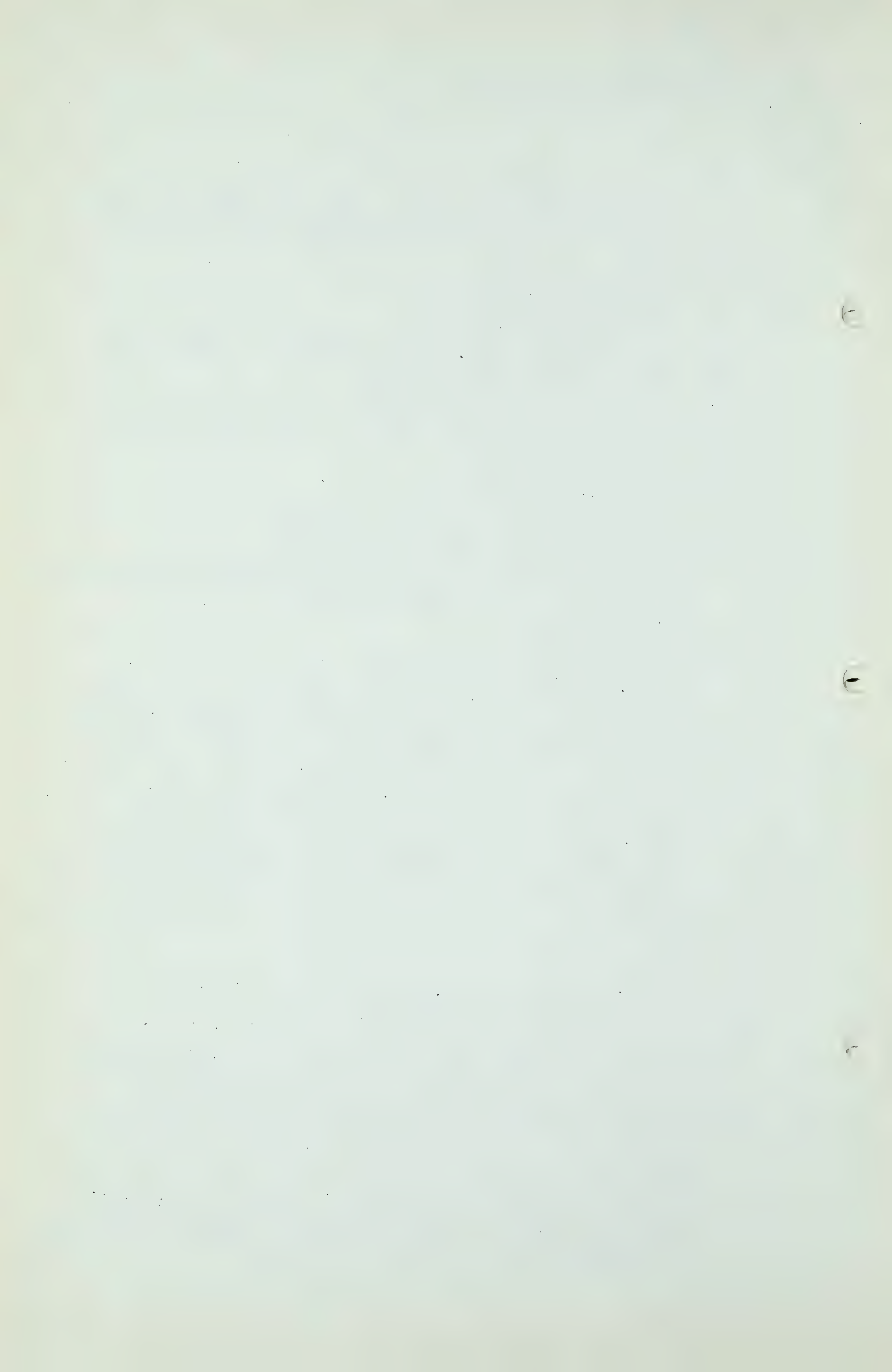
Q Do you know who Mr. Zinder is?

A I know that he was an American chemist, I think, that was brought to the Dinning Commission, was he not?

Q I understand that he is an expert in utility economics?

A Well, yes.

Q Will you agree with his statement, Number 1, "The most important economic factors determining location of industry, in decreasing order of significance are:"



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A Where is that?

Q It is right in front of you, Mr. Lang.

A "H.Zinder, (1)".

Q No, go down to the next paragraph where it starts "In the 1939 study", and then in the next paragraph, "In his study, based on 1939 conditions, Zinder stated"...?

A Yes.

Q "... (1) The most important economic factors determining location of industry, in decreasing order of significance are:

(a) Market conditions.

(b) Labour - cost differentials.

(c) Raw materials, including fuel considerations."

I think you would be in agreement with that statement, wouldn't you, the portion I have read?

A I think so.

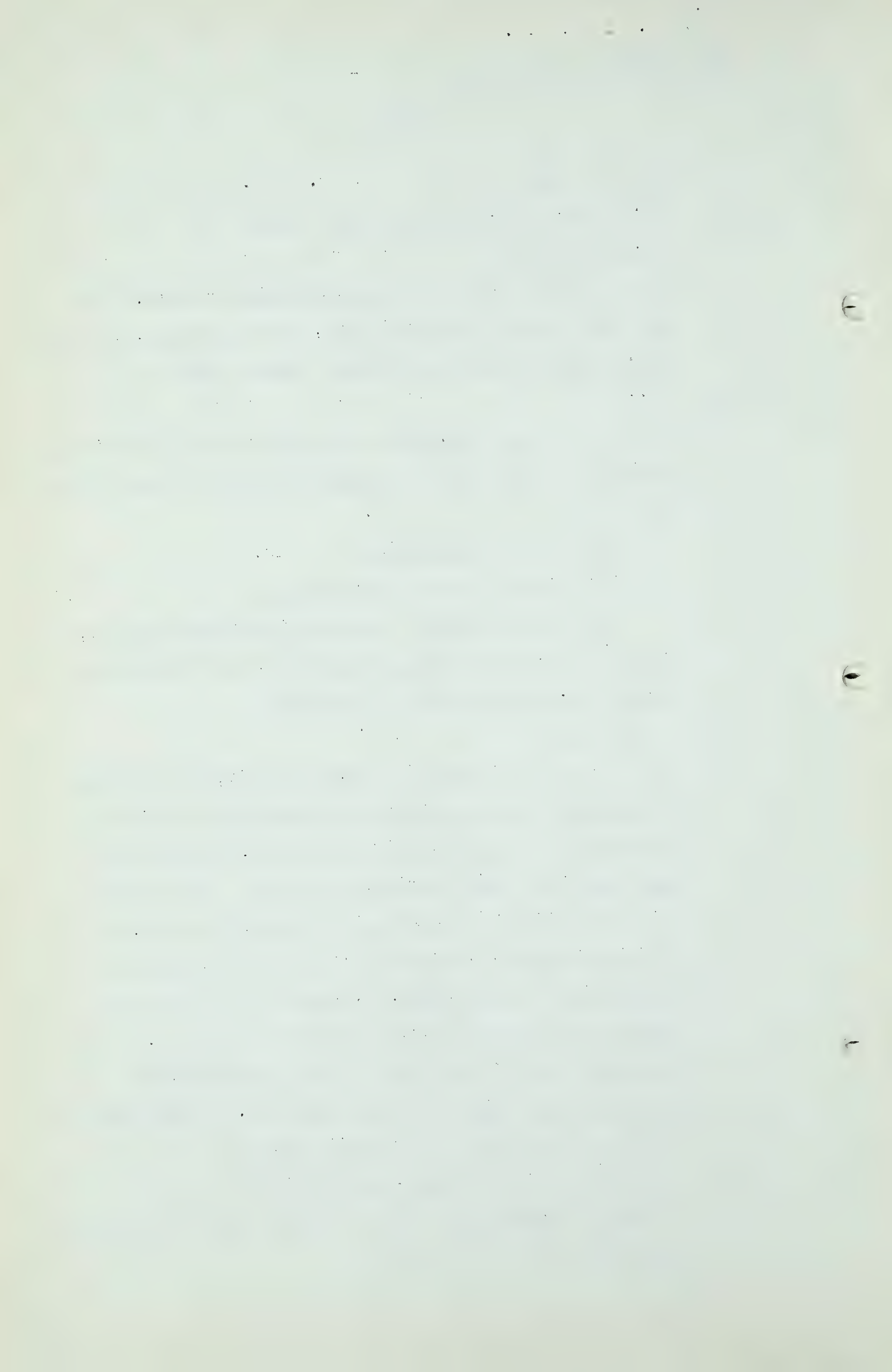
Q Now, let us read Number 2, "The availability of cheap or abundant natural gas is not, generally, of itself an effective determinant in the location of industries, even among the most intensive gas users. Since this is true for these industries, it must be even more so for manufacturing industries in general, in which, during recent years, fuel has contributed 1.5% to the total value of the product, exclusive of costs of transportation to the market and of distribution."

You would also agree with that statement of Mr.Zinder's?

A I have not the facts to disagree with it.

Q So that you could not quarrel with it?

A I couldn't quarrel with it. I haven't the facts to disagree with it.



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Q No. Now, Mr. Lang, in Alberta I think we have all the constituent elements necessary to make nylon?

A Correct.

Q Limestone, coal, air and water?

A Yes.

Q But we do not make any nylon here, do we?

A Not yet.

Q We do not make any nylon here, do we?

A No, not yet.

Q Not yet?

A No.

Q Have we the elements necessary to make synthetic rubber in Alberta?

A We have the two chief elements, or, at least, the possibility of the two chief elements.

Q Yes?

A We have butane from which butadiene can be got, and we have natural gas from which carbon can be made.

Q But we do not make any synthetic rubber yet?

A I suggested.....

Q My question was, do we make synthetic rubber in Alberta?

A No, not yet.

Q No, not yet?

A No, I suggested in the submission that as, shall I say, a security measure, it might be desirable that there be decentralization of industry, and that is one of the possibilities.

Q Yes. Now, bearing in mind that the most important economic factors, in decreasing order of significance, are market conditions, labour, cost differentials, and raw materials,

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including fuel considerations, we have a problem now in Alberta, or, I mean, we have a population now in Alberta of something between 800,000 and 900,000, and you think that might be doubled by the year 2000?

A That is from the general trend, yes.

Q Yes. Do you think that by the year 2000 we will be making nylon stockings in Alberta?

A I would hope that we would be.

Q With a population of 1,600,000 in Alberta, do you think we would be making nylon stockings then?

A I hope we would be.

Q Do you know where nylon is made in the United States? Is it made in Texas?

A I couldn't answer that question.

Q You do not know?

A No.

Q I suggest it is not. Where is the synthetic rubber plant or where is synthetic rubber made in Canada?

A Sarnia.

Q Where is it made in the United States?

A I am sorry, I can't answer that.

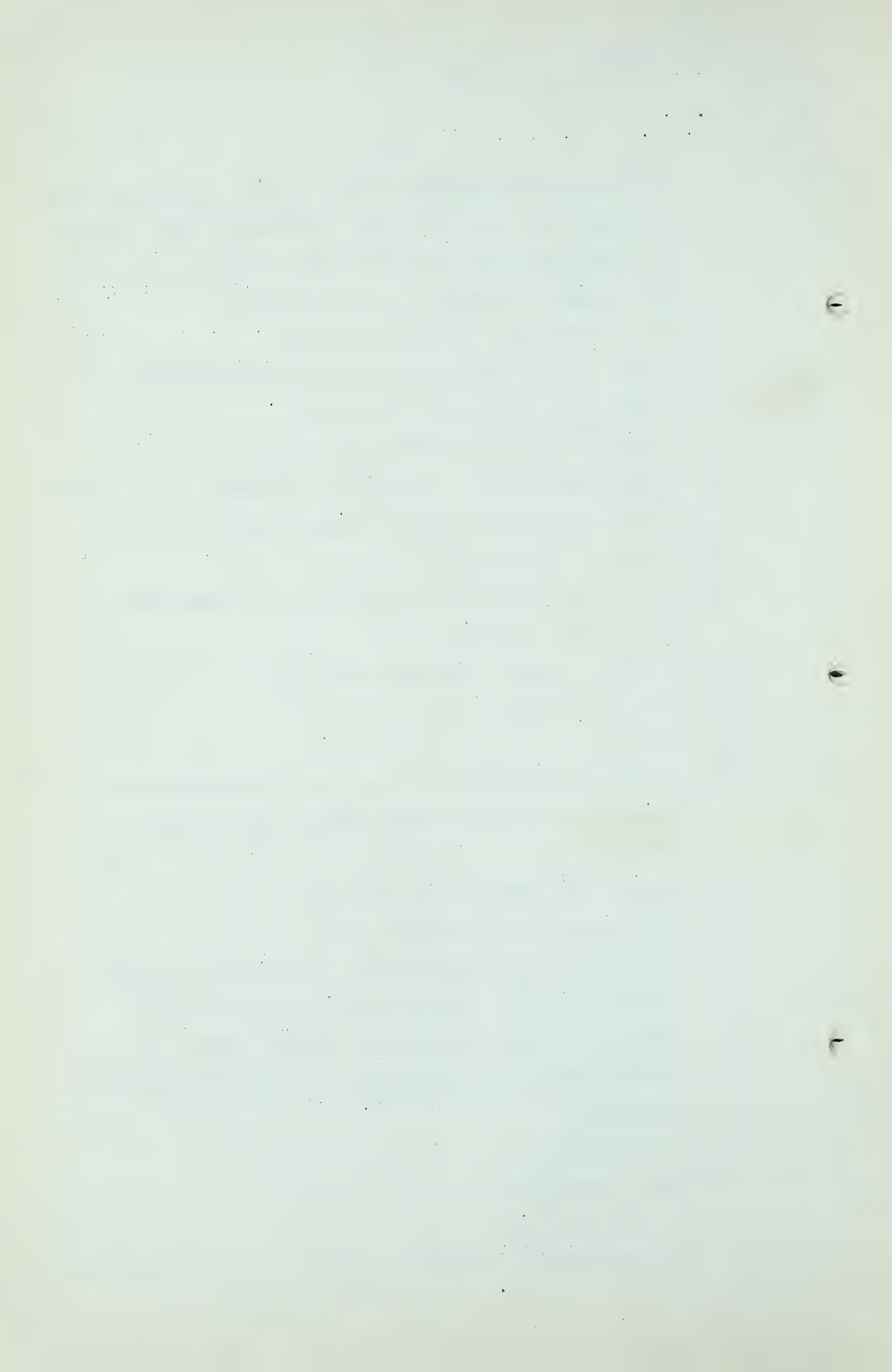
Q Do you think that an increase in our population from 800,000 to 1,600,000 might cause a sythetic rubber plant to be built in Alberta, notwithstanding the adverse effect of freight rates and our geographical position?

A I suggested it.

Q As a possibility?

A As a possibility.

Q No more than a possibility? You do not want to get into



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this subject of freight rates you told my learned friend,
Mr. Nolan, and you are not an economist?

A I am not an economist.

Q All right, thank you.

THE CHAIRMAN: Thanks, Mr. Lang.

MR. C. E. SMITH: With your permission, sir,
might I call Mr. Russell?

.....

BENJAMIN RUSSELL, having been
first duly sworn, examined by Mr. C. E. Smith, testi-
fied as follows:-

Q Mr. Russell, you are Chairman of the Alberta Power Com-
mission?

A Yes, sir,

Q And your Commission has prepared a report which you pre-
sently have in front of you, is that correct?

A That is right.

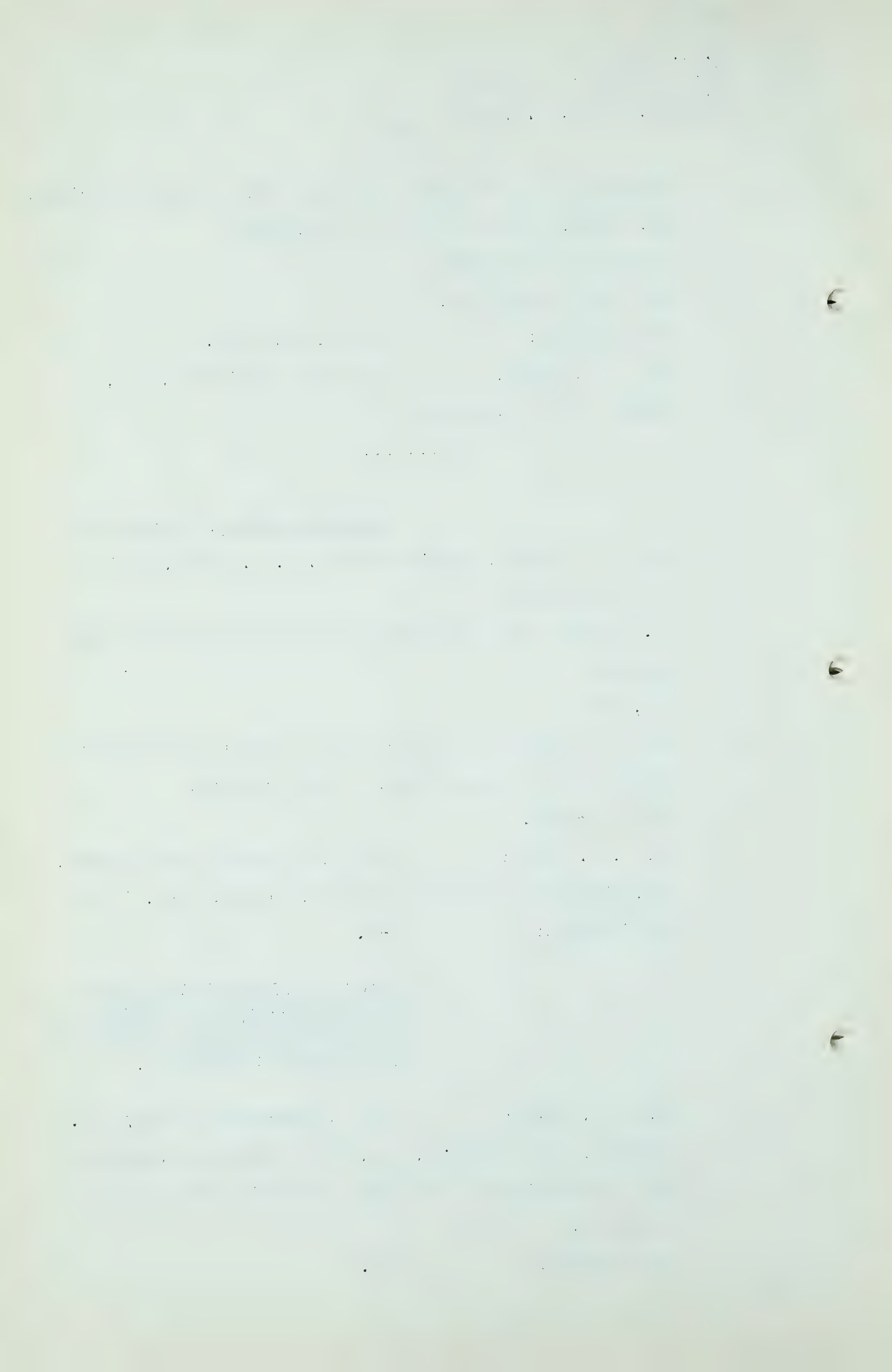
MR. C. E. SMITH: And I am tendering that report,
sir, which will be given a number, please. J-9, is it?

THE CHAIRMAN: J-9.

REPORT OF ALBERTA POWER COMMIS-
SION RE ESTIMATE OF NATURAL
GAS RESERVATIONS FOR GENERATION
OF POWER IN ALBERTA TO YEAR
1960 MARKED EXHIBIT J-9.

MR. C. E. SMITH: It is comparatively brief, Mr.
Chairman, and I suggest, sir, that probably Mr. Russell
might be permitted to read the submission that we have
before us.

THE CHAIRMAN: Yes.



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Q MR. C. E. SMITH: Will you do that, Mr. Russell?

A Yes. In order to arrive at some intelligent conclusions with respect to the amount of natural gas which should be reserved in Alberta, it is necessary to give consideration to the present and future power requirements of the Province. For this purpose it is necessary to consider a number of main factors which affect any estimate or guess of future requirements. These main factors are as follows:-

First:- The present and future power requirements for the Province.

Second:- The trends of production of electric power within the Province.

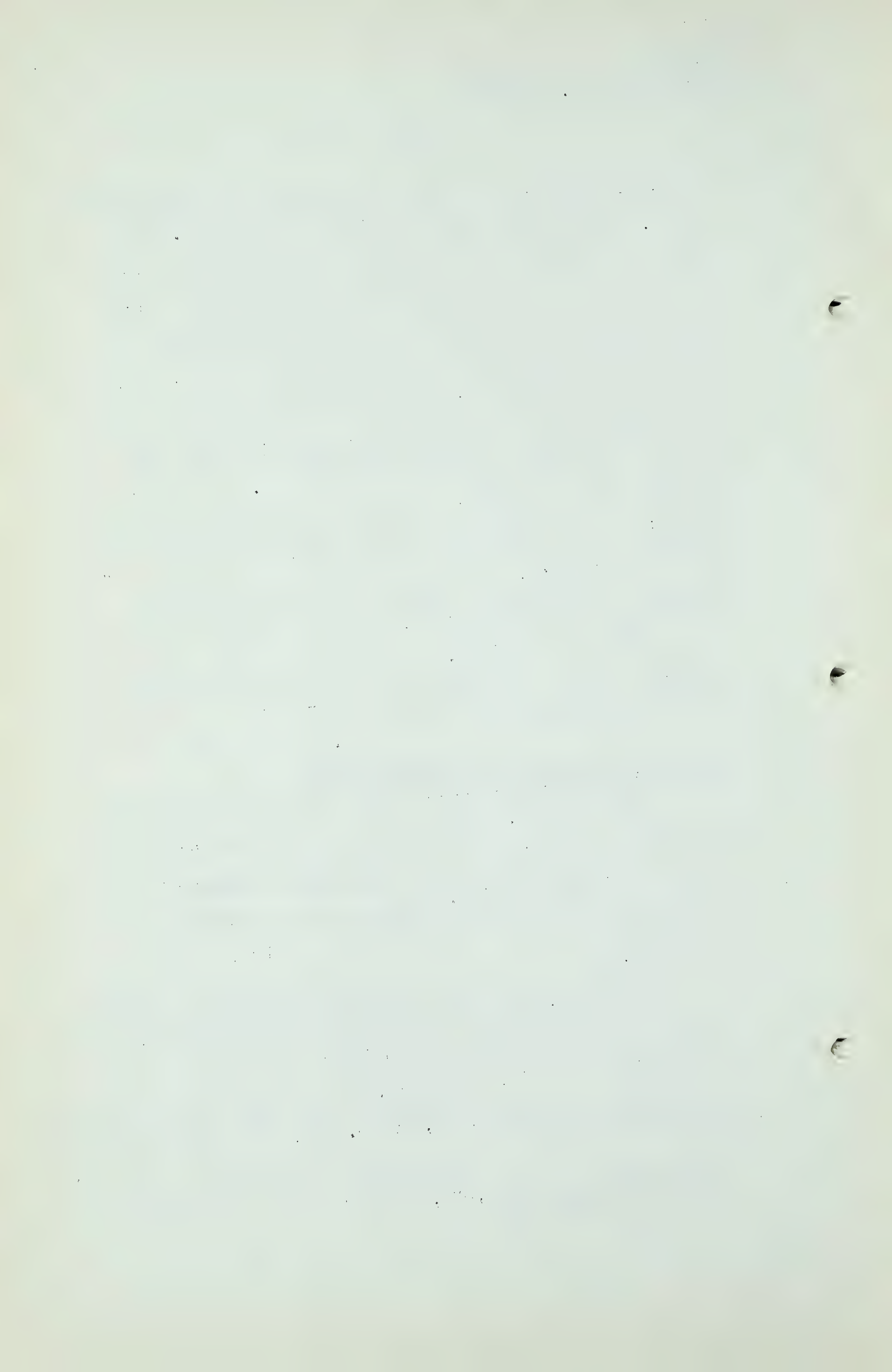
Third:- Some consideration of hydro-electric energy generation within the Province.

PRESENT AND FUTURE POWER REQUIREMENTS

Attached hereto, is a graph showing the growth of the Calgary Power Limited system load from the year 1928 to the year 1949 inclusive. This is an indication of the trend of the power requirements of the Province for that period.

The following, taken from Power Commission records, shows the growth of the power load in the Province for the period 1945 to 1949, inclusive.

| | | |
|-----------------------|----------------------|--------------------|
| Year 1945 | 566,240,917 Kw. Hrs. | |
| Annual increment 1946 | | 33,087,751 Kw.Hrs. |
| Year 1946 | 599,328,668 | " |
| Annual increment 1947 | | 74,551,324 " |



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| | | |
|-----------------------|---------------------|--------------------|
| Year 1947 | 673,879,992 Kw.Hrs. | |
| Annual increment 1948 | | 88,235,544 Kw.Hrs. |
| Year 1948 | 762,115,536 | " |
| Annual increment 1949 | | 106,392,688 " |
| Year 1949 | 868,508,224 | " |

It will be noted from the attached graph that although the rate of growth just prior to 1929 was something like 25 million Kw. Hrs. per year, this rate fell off rapidly in the following years and never reached the 25 million annual increase again until the year 1941. The graph is indicative of what may again occur and should have a sobering influence when considering the growth of the power in the Province during the past five years as tabulated above.

Q Excuse me, Mr. Russell, but shouldn't the word "load" be in there?

A That is right, it should be in there.

The increase in the total power load for the Province for the period 1945 to 1949 is 302,267,307 Kw. Hrs. or almost fifty-four per cent of the 1945 load; the increase during the year 1947 was between twelve and thirteen per cent of the 1947 load, and the average annual increase for the period 1946 to 1949 inclusive was 89,726,518 Kw. Hrs. This rate of increase for the next eleven years would indicate a total load for the Province by 1960, of approximately 1855.5 million Kw. Hrs. per annum, or for that particular year.

While such a prediction might appear optimistic, in view of what happened during the period years 1929 to 1940, it is considered to be at least a reasonable

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basis as an estimate for present purposes.

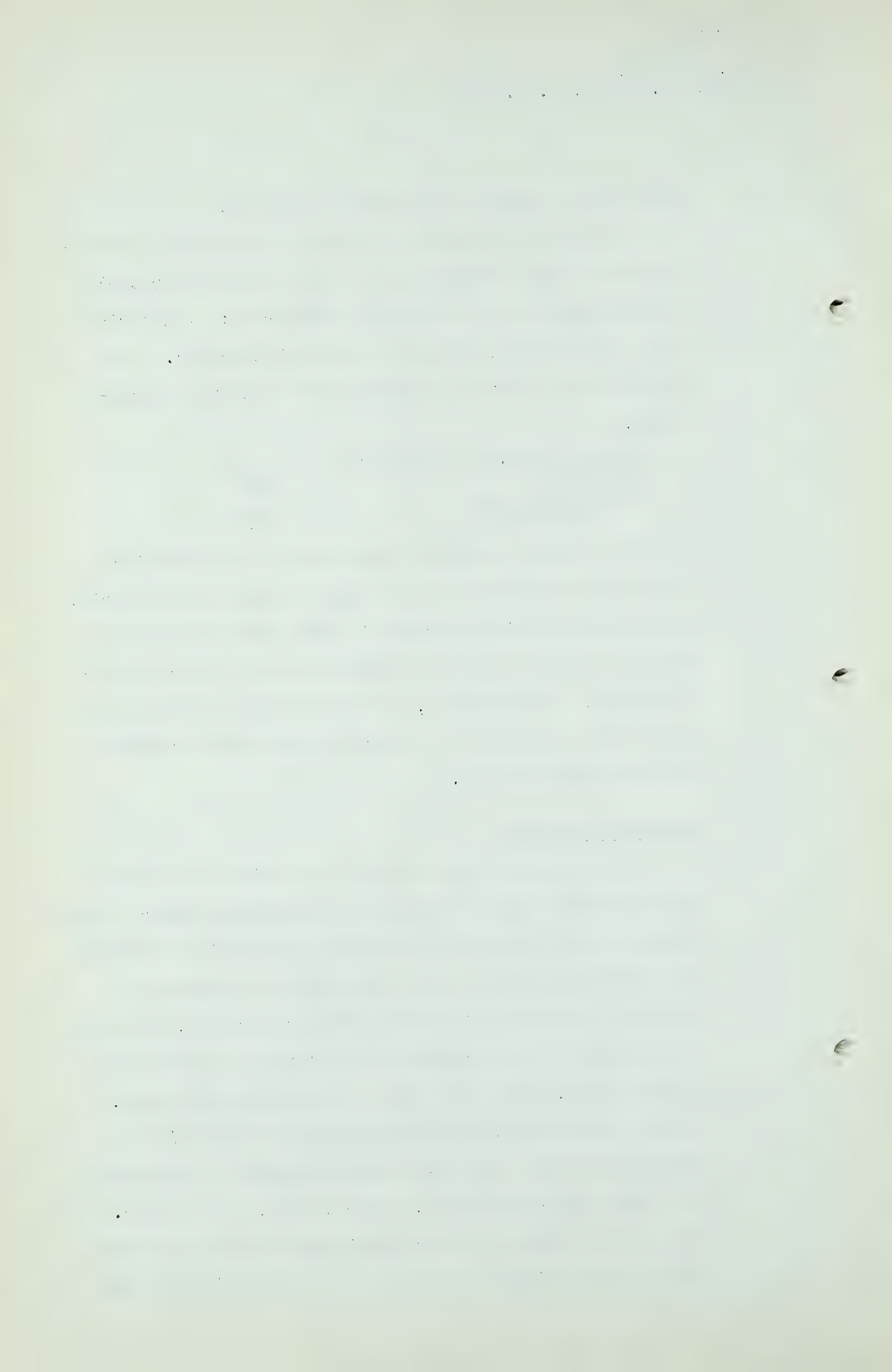
It may be of interest to point out that the distribution of power throughout the Province may be roughly broken down into the following categories: Industrial Power, Commercial, Domestic and Rural Electric. The figures for 1949 would indicate the following percentages:

| | |
|------------------------------|-----|
| Rural Electric approximately | 3% |
| Domestic " | 20% |
| Commercial and Industrial " | 77% |

In view of the industrial development of the Province it is safe to assume that of these groups the industrial and commercial will increase to the greatest extent in the next several years as compared to the other classifications. Consequently, the percentages of the lesser groups will decrease on a proportionate basis compared to the industrial use.

PRODUCTION TRENDS

It is evident that there is a limit to the development of what may be considered cheap water power in the Province and it might be considered advisable ultimately for the Government to take any measures necessary to regulate the price of gas for power generation, that is, if the price of gas remains or is forced to remain at a low figure, more power will be generated using gas. If the price of gas is forced upward by competitive demands by other consumers then the amount of gas used for power production will, consequently, be lessened. The present trend of development would seem to be from coal to natural gas but there is no indication yet that



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power can be generated as cheaply by natural gas as by hydro power in the Province.

HYDRO POWER

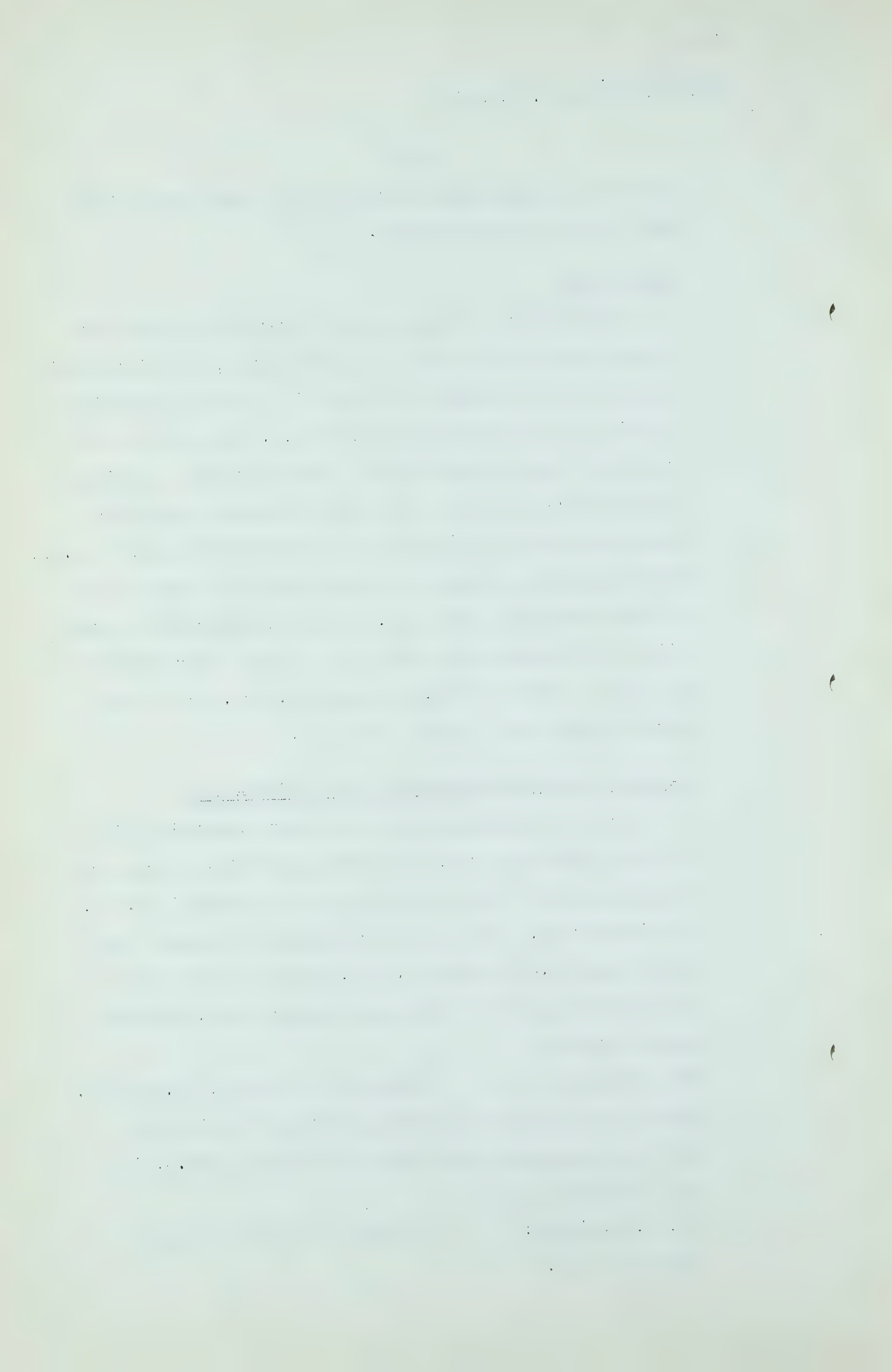
Practically all hydro power development within the Province has so far been on the Bow River, and at present consists of five power stations with a total generating capacity of approximately 106,000 H.P. The addition of the Spray Lake storage and the three new power stations now under construction below, will increase the generating capacity of the system to approximately 220,500 H.P., which might be estimated to take care of an annual load of some 700 million Kw. Hrs. Unless further water power sites are constructed in the near future, there would be by 1960, a load of 1155.5 million Kw. Hrs. to be taken care of from other sources of power.

NATURAL GAS REQUIREMENTS FOR POWER GENERATION

From the examination of the plants producing electricity powered by gas, it would appear that it requires approximately 20 cubic feet of gas to produce 1 Kw. Hr. of electricity. It would be reasonable to assume then that the 155.5 million Kw. Hrs. might be taken care of by the development of additional water power, coal and Diesel plants.

THE CHAIRMAN: Excuse me a minute, Mr. Russell.
Would that figure not correspond to the one in the previous paragraph there that you have of 1155.5, in the paragraph above?

MR. C. E. SMITH: I think the next sentence explains that.



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A That is subtracting 1 billion from the previous figure.

Q THE CHAIRMAN: But the figure of 155.5, how
is that arrived at?

A I said in the previous statement....

MR. C. E. SMITH: The next sentence says, " There
would still be a billion kilowatt hours required by
1960."

A Yes, the 155.5 would be looked after by some other plants.

Q May I suggest that you eliminate the word "the" in the
front of 155.5?

A It would be reasonable to assume then that the 155.5
million kilowatt hours might be taken care of by the
development of additional water power. I perhaps should
have said that the balance of 155.5 million kilowatt
hours might be taken care of by the development of ad-
ditional water power, coal and Diesel plants.

Q Would it be correct to say that it would be reasonable
to assume then that the 155.5 million kilowatt hours
might be taken care of by the development of additional
water power, coal and Diesel plants, and there would
still be a billion kilowatt hours required by 1960
which might have to be generated with natural gas.

A Yes. There would still be a billion kilowatt hours
required by 1960 which might have to be generated with
natural gas. Thus, it would appear that the gas
required by 1960 for the generation of electric power
could be estimated at 20 billion cubic feet per annum.

It should be noted that the foregoing estimate is
limited to a period of approximately ten years. This
is for the reason that it is not possible to intelligently

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predict beyond such period. Any estimate covering a longer period than this, say fifty years would be, to say the least, highly conjectural.

We admit that it is pretty much of an intelligent guess.

Q Thanks, Mr. Russell.

MR. S. B. SMITH: Shall I proceed, sir?

THE CHAIRMAN: Yes.

.....

CROSS-EXAMINATION BY MR. S. B. SMITH:

Q Mr. Russell, you have been principally associated with the development of water resources, that is your field?

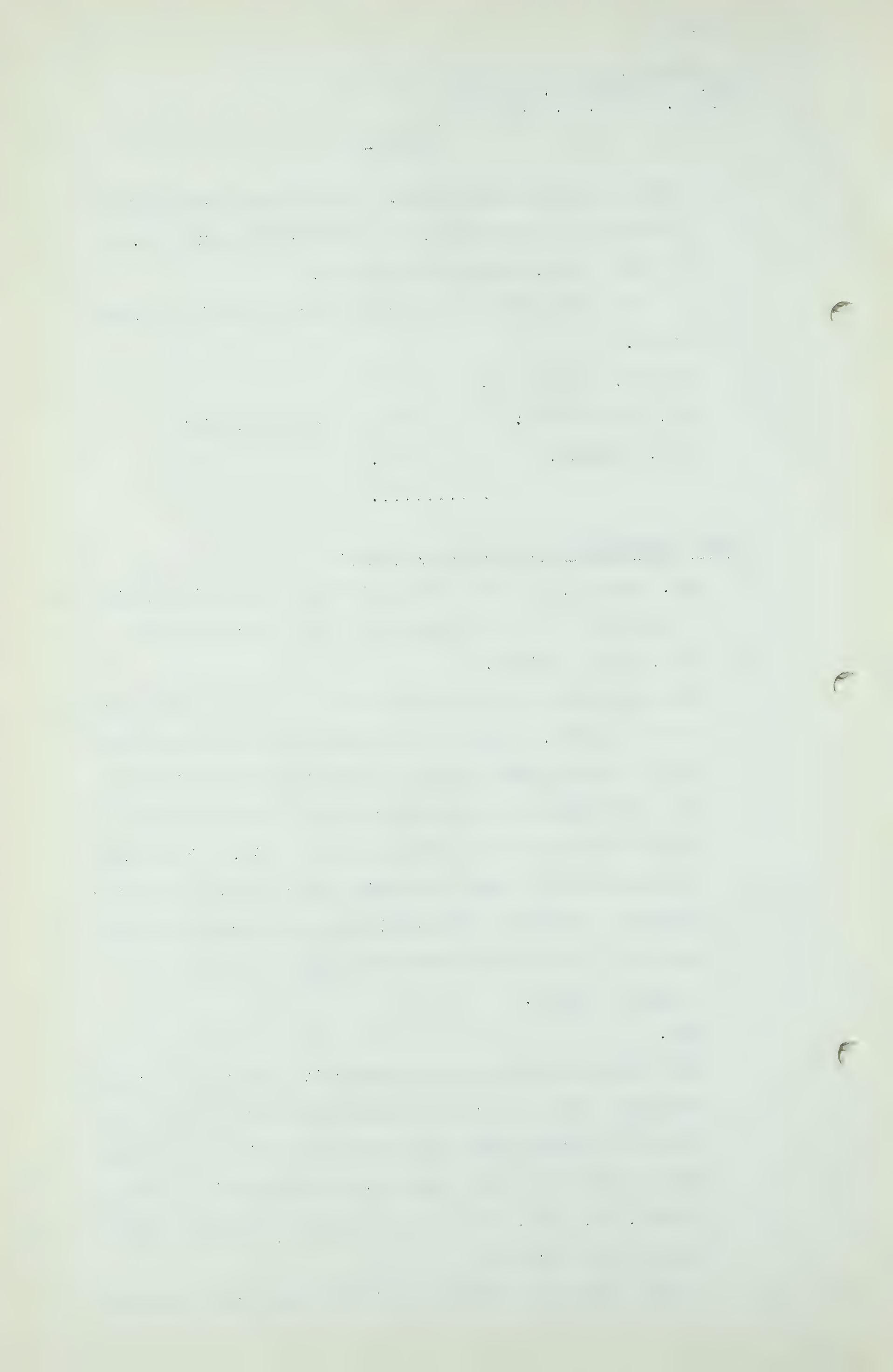
A Yes, that is right.

Q Now, in respect to the future uses of gas for the development of power, at page 2 you have pointed out that the rate of growth just prior to 1929 fell off rapidly in the following years and never reached the 25 million annual increase again until the year 1941. "The graph is indicative of what may again occur and should have a sobering influence when considering the growth of the power in the Province during the past five years as tabulated above."

A Yes.

Q What did you mean by that statement? Do you mean by that statement that by reason of the fact that we had a long period in Alberta when the annual load did not increase that we might run into those conditions again in the future, or, that, at least, we should take that possibility into account?

A I think there is a chance that you might run into those



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conditions in the future.

Q Yes? And I agree with you that it is wise to take those past facts into account, and that they should have a sobering influence?

A That is right.

Q Well, Mr. Russell, when you came to projecting the annual load from 1950 up to 1960....

A Yes.

Qdid they have an influence on you, that is, the lack of growth during the years 1929 to 1940?

A No, they did not.

Q They did not?

A No, I considered.....

Q Yes?

A We considered it better in an estimate of this kind to be optimistic and make good reservations of gas.

Q Yes,

A And we are only estimating to 1960.

Q I understand that. But what you did actually, you did not let the history from 1929 to 1940 affect you at all, although you pointed out that it should have a sobering influence?

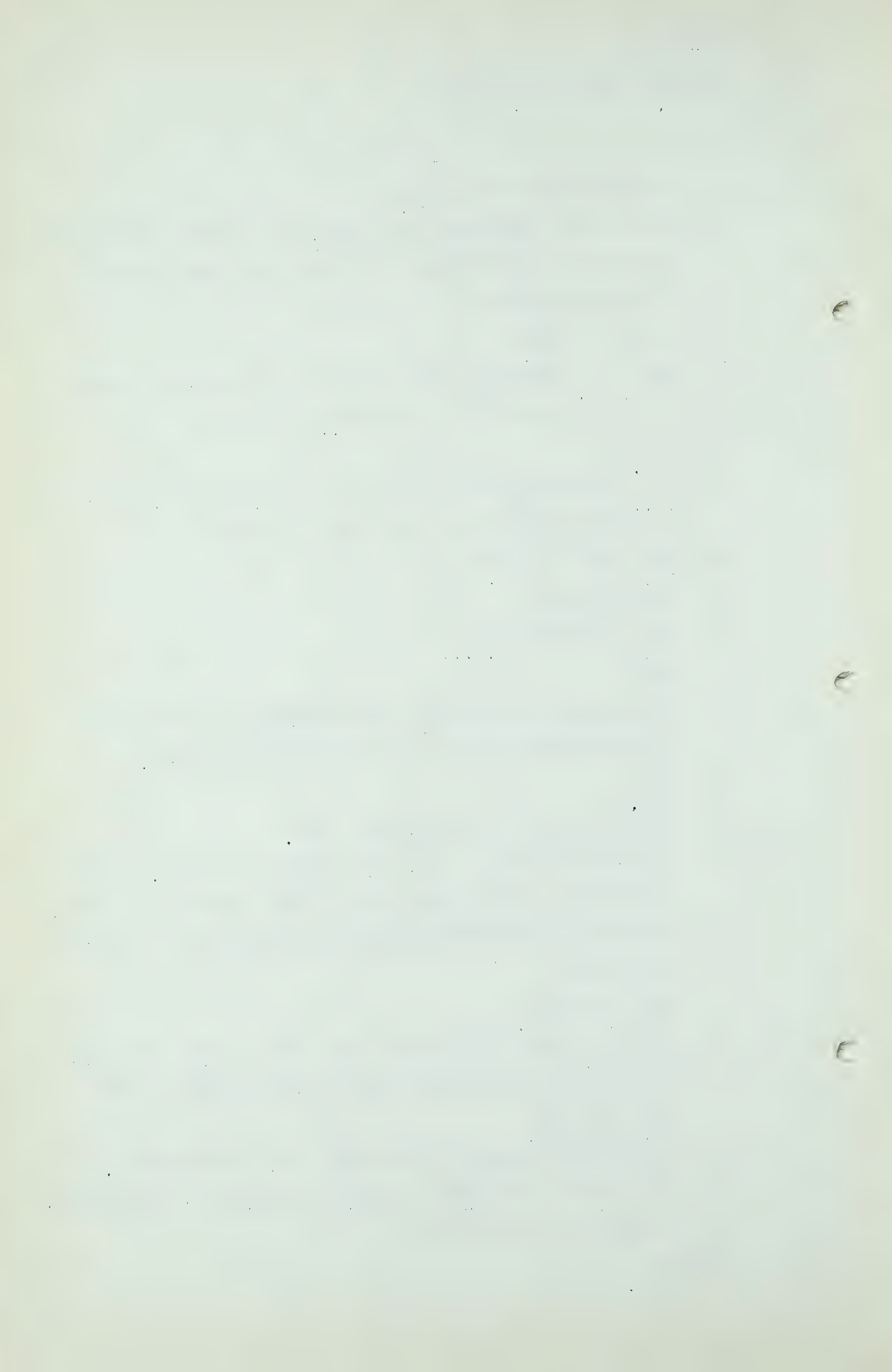
A That is right.

Q In fact, when you projected from 1950 to 1960 what you did was to take the very high period of growth from 1946 to 1949?

A We took the average of the last four or five years.

Q And that was the greatest period of growth in the history of Alberta, was it not?

A Yes.



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Q So that you have been either extravagant or conservative, depending on the person's point of view? You have taken a maximum, really, haven't you? You have taken a maximum expectation of the growth of the power load during the next ten years, haven't you?

A We have taken the average for the last four or five years of what will happen up to 1960, which is probably optimistic.

Q Now, you do point out that you still cannot generate power by the use of gas as cheaply as you can by the use of hydro power? Are you familiar with the attitude of the Federal Power Commission in Washington as to the use of natural gas as boiler fuel?

A No, I am not familiar with it, sir.

Q Then you do not know whether it is or is not their policy that there should be a minimum use of natural gas as boiler fuel because it is considered to be a wasteful use of a precious fuel?

A I did not know that it was their opinion, but I would agree with it.

Q You do not know whether it is or not?

A No.

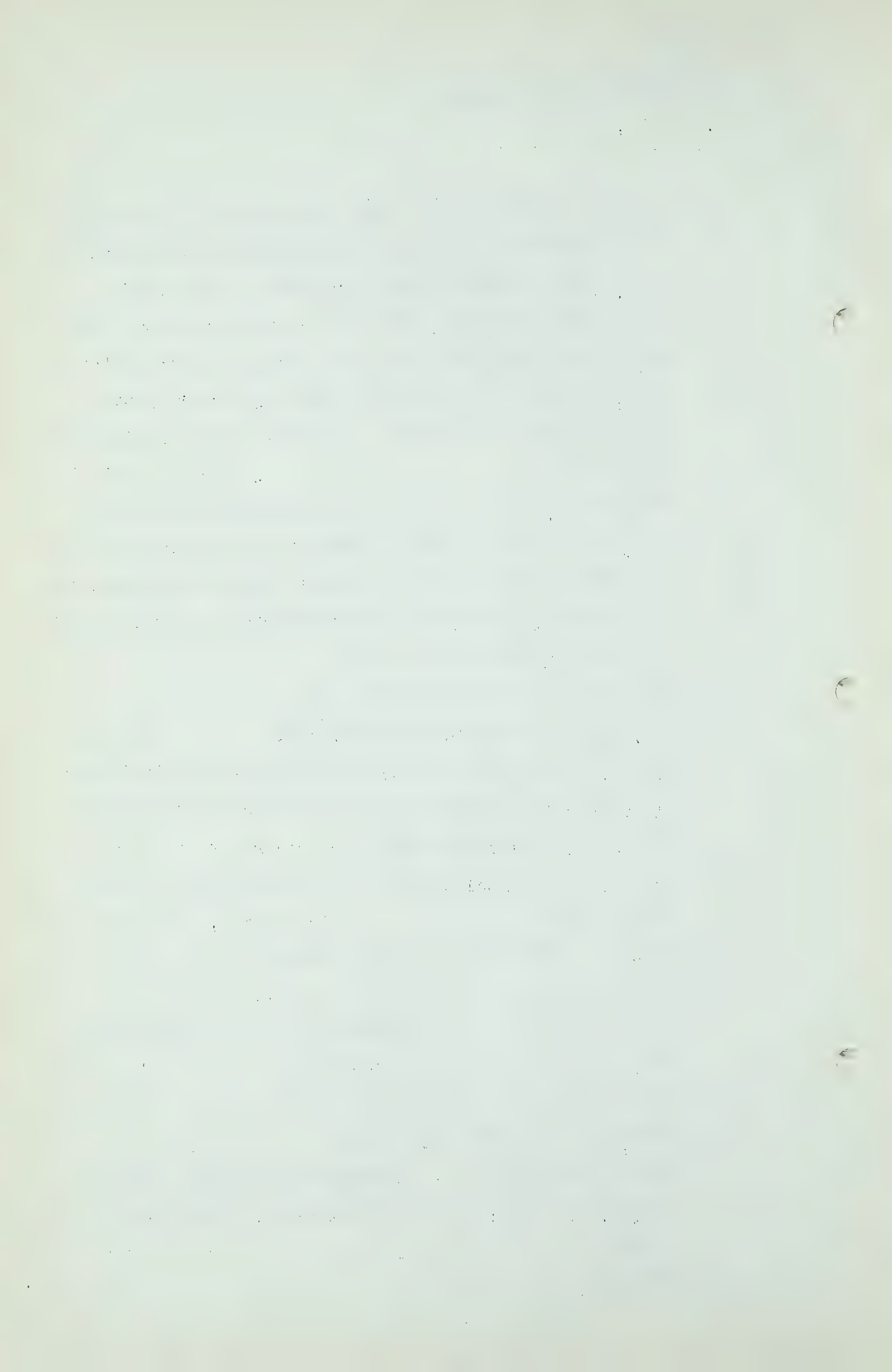
Q MR. McDONALD: Pardon me? Do you agree with it?

A Yes, I would say I do.

Q I wanted to be sure about that.

Q MR. S. B. SMITH: And Alberta, besides being a source of natural gas, it has or is a great source of coal?

A What was that again?



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Q Alberta, besides being the source of natural gas, it is a great source of coal?

A Yes.

Q We have in Alberta approximately 12% of the coal deposits?

A I don't know.

Q Thereabouts?

A I do not know that.

Q We have tremendous deposits?

A Yes.

Q And coal can be very cheaply purchased in Alberta, due to the development of modern mechanization and stripping, and that kind of thing, the price of coal is getting cheaper, and they are endeavouring to devise means of competing with fuel oil and other things?

A They are endeavouring to do that, but I would not say that coal is getting cheaper.

MR. C. E. SMITH: I was wondering if you were going to say that.

Q MR. S. B. SMITH: Cheaper in comparison to deep mines, is what I am referring to?

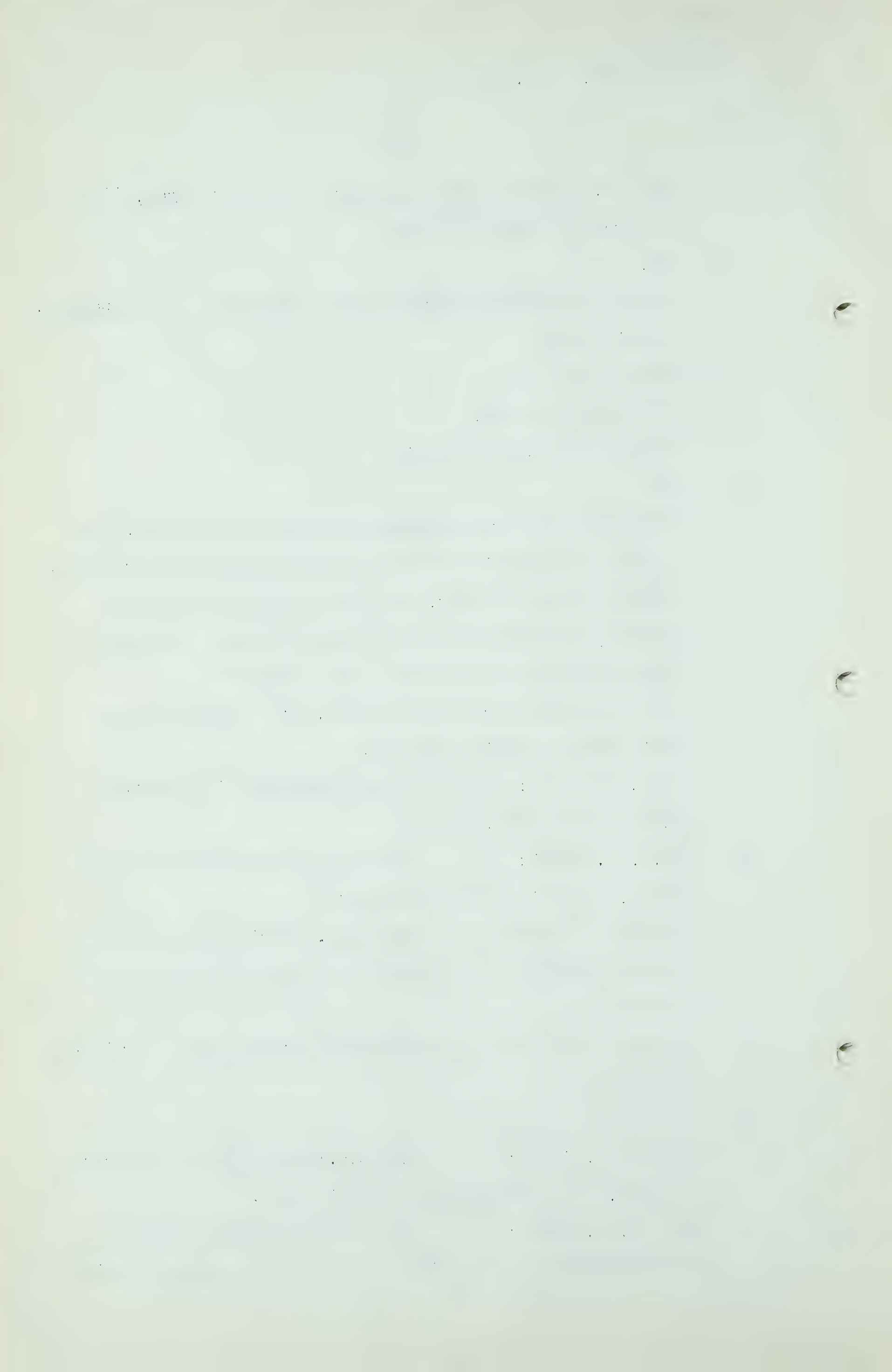
A I cannot be prepared to say that. Strip mining should make it cheaper, but the price of coal is going up all the time.

Q Yes, but the price of everything else is going up all the time too?

A Yes.

MR. C. E. SMITH: Ask Mr. Fenerty about the price of gas, it is going up all the time too.

Q MR. S. B. SMITH: And the petroleum industry is developing oil in Alberta. And are you familiar with



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the products, residue products that are produced in the refining of crude oil at all?

A Not very well acquainted with it. That is not my line.

Q I see. Do you know whether there is any problem about the disposal of those residue products in connection with refining, Mr. Russell?

A Well, I do not know that as a fact, but I would think that there would be.

Q Do you know that as new refineries are constructed and crude production is increased, that these residues will increase and that markets will have to be found for those by-products?

A Well, I would presume that they would.

Q And those are possible sources of cheap fuel, are they not?

A I think you had better ask somebody that knows more about it than I do.

Q You have not taken those into account at all in your presentation?

A No, sir.

Q Thank you, Mr. Russell.

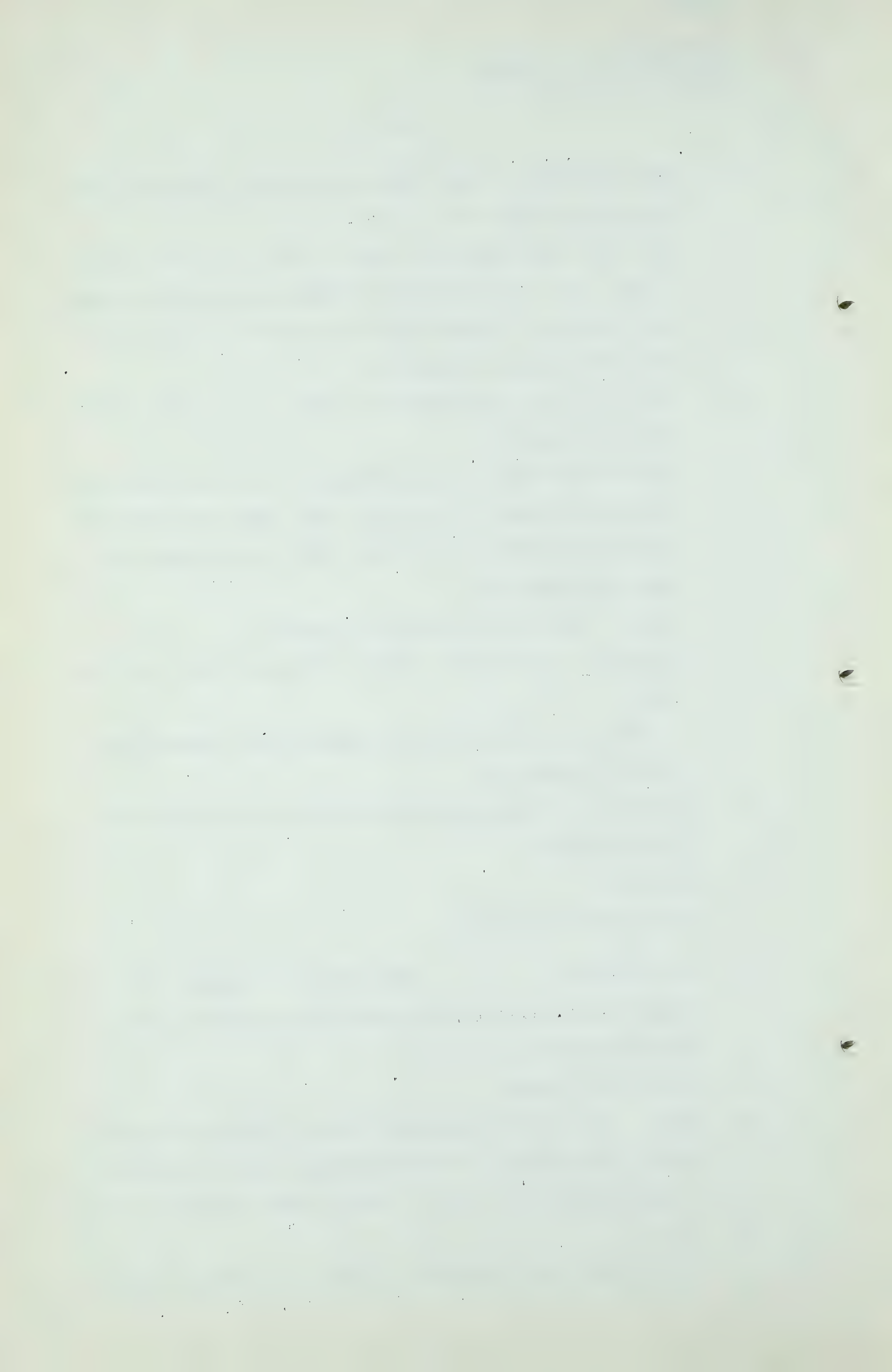
Q DR. GOVIER: Mr.Russell, I wonder if I might ask you a question about the paragraph headed "Hydro Power" on page 3?

A Yes, Hydro Power?

Q Yes. In the last sentence you say "Unless further water power sites are constructed in the near future, there would be by 1960, a load of 1155.5 million", etc.?

A Yes.

Q Do you have any knowledge, Mr.Russell, of any further



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water power sites under consideration?

A Oh, yes.

Q Do you think there is any likelihood of any further water sites being developed in the near future?

A Oh, yes.

Q Well, could you expand on that, Mr. Russell, and tell us how that might affect the picture here?

A Well, I would think, as I say here, there would be 155.5 million left to be taken care of by other water sites or other plants of some kind and I would think the minute that the Calgary Power Company built their Spray plant and got it completed and saw that their power load was still gaining on them, they would immediately want another plant built on the Bow River.

Q Well, do you believe the 155 - I mean, do you believe the portion of the 155 million kilowatt hours which you were assigning to new water power development includes all of those that might reasonably be constructed in the near future?

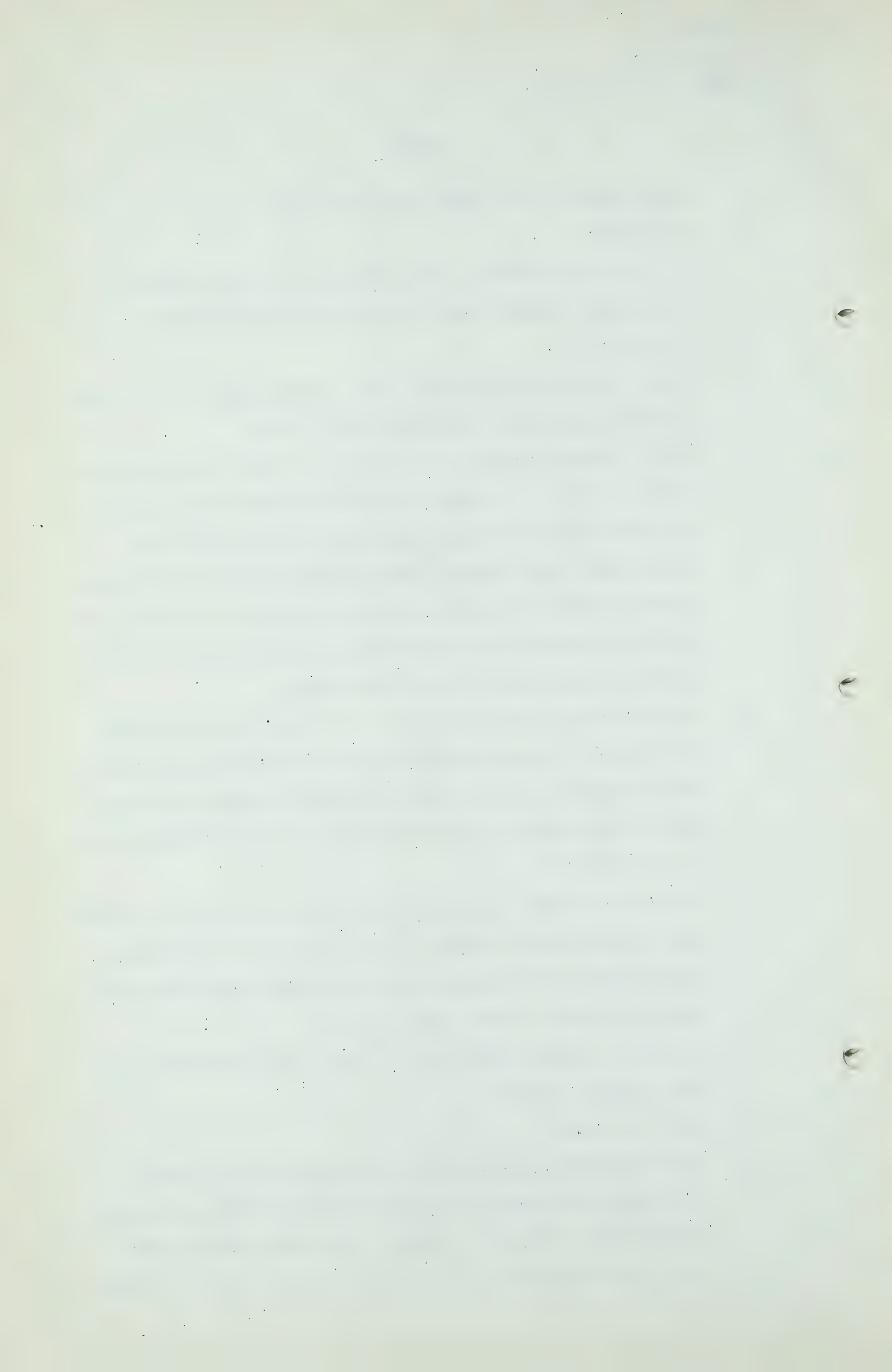
A Well, no, I would say that you would not be able to take care of that much energy by one plant, and, therefore, the Calgary Power Company would perhaps undertake more than one plant in the near future.

Q Is there any possibility of plants being developed on other river sites?

A Not very much.

Q What about the Saskatchewan, the North Saskatchewan?

A Well, when you start to go into another river, you are getting into expensive power. The cheap water power is on the Bow River, and will be for some time to come.



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Q You do not believe that there would be any development on the North Saskatchewan, say, in the next ten years?

A No, I do not think so.

Q Thanks.

MR.D. P. McDONALD: May I ask a question, Mr. Chairman?

THE CHAIRMAN: Yes.

.....

CROSS-EXAMINATION BY MR.D. P. McDONALD:

Q The only point I wanted to raise, Mr. Russell, was, on page 3 where you refer to the 155 million kilowatt hours might be taken care of by development of additional water power, coal and Diesel plants. Now, that seems to indicate that there is some reason why you cannot do more than 155 million. Is there any reason in the world why you cannot use all the coal in Alberta to produce power from if you want to? Is there any restriction on the use of coal?

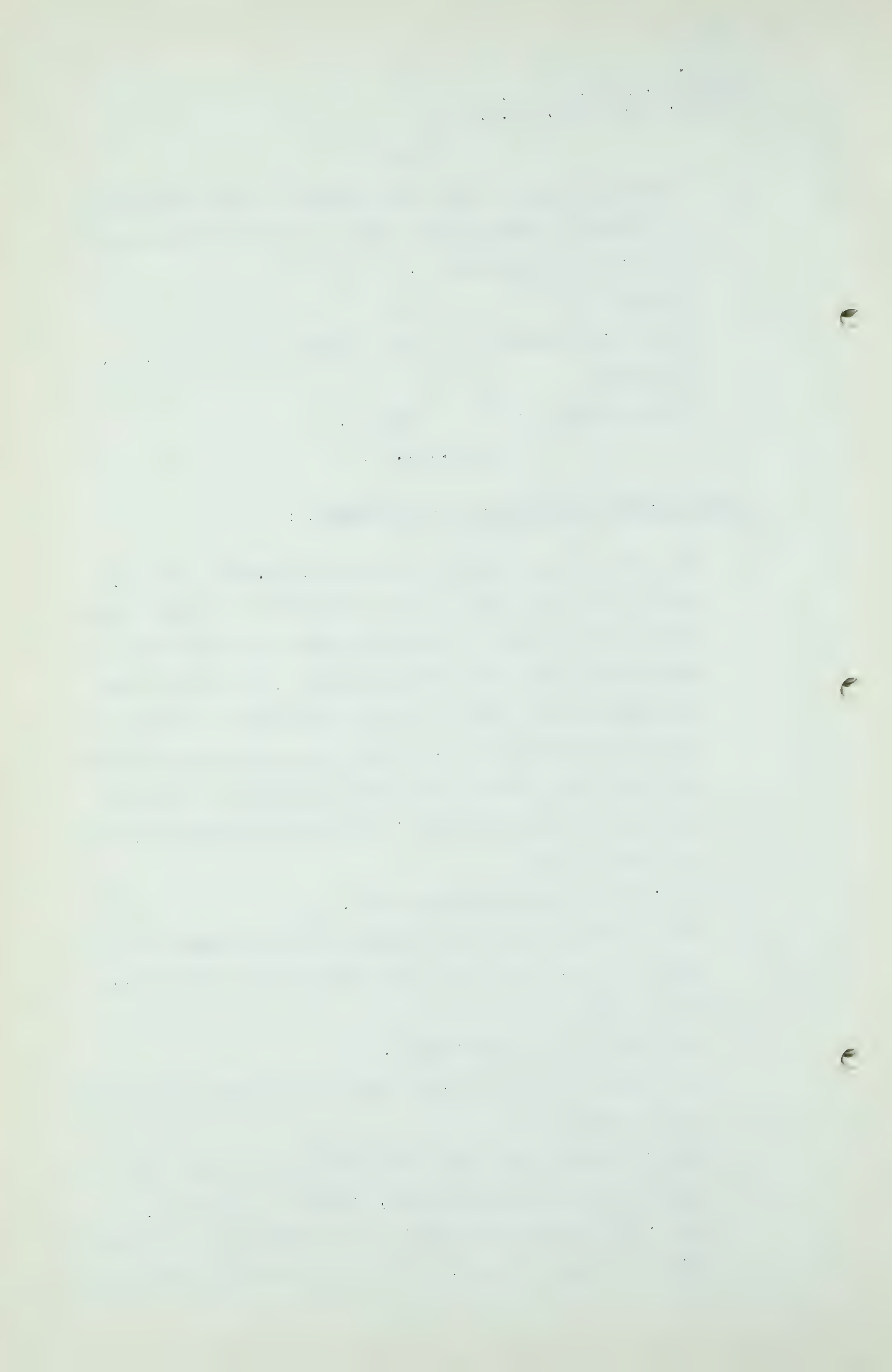
A No, not any restriction at all.

Q If you have a very large supply of either Diesel oil or crude oil, you could use that, there is no restriction on the supply of it?

A No, there is no restriction.

Q Is it your opinion that gas should be cheaper than either coal or Diesel?

A Well, I think I have made the statement here that it depends on the price of coal, whether it competes, I mean, it depends on the price of the gas whether it competes with coal or not. Gas is very much more convenient



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than coal to start with.

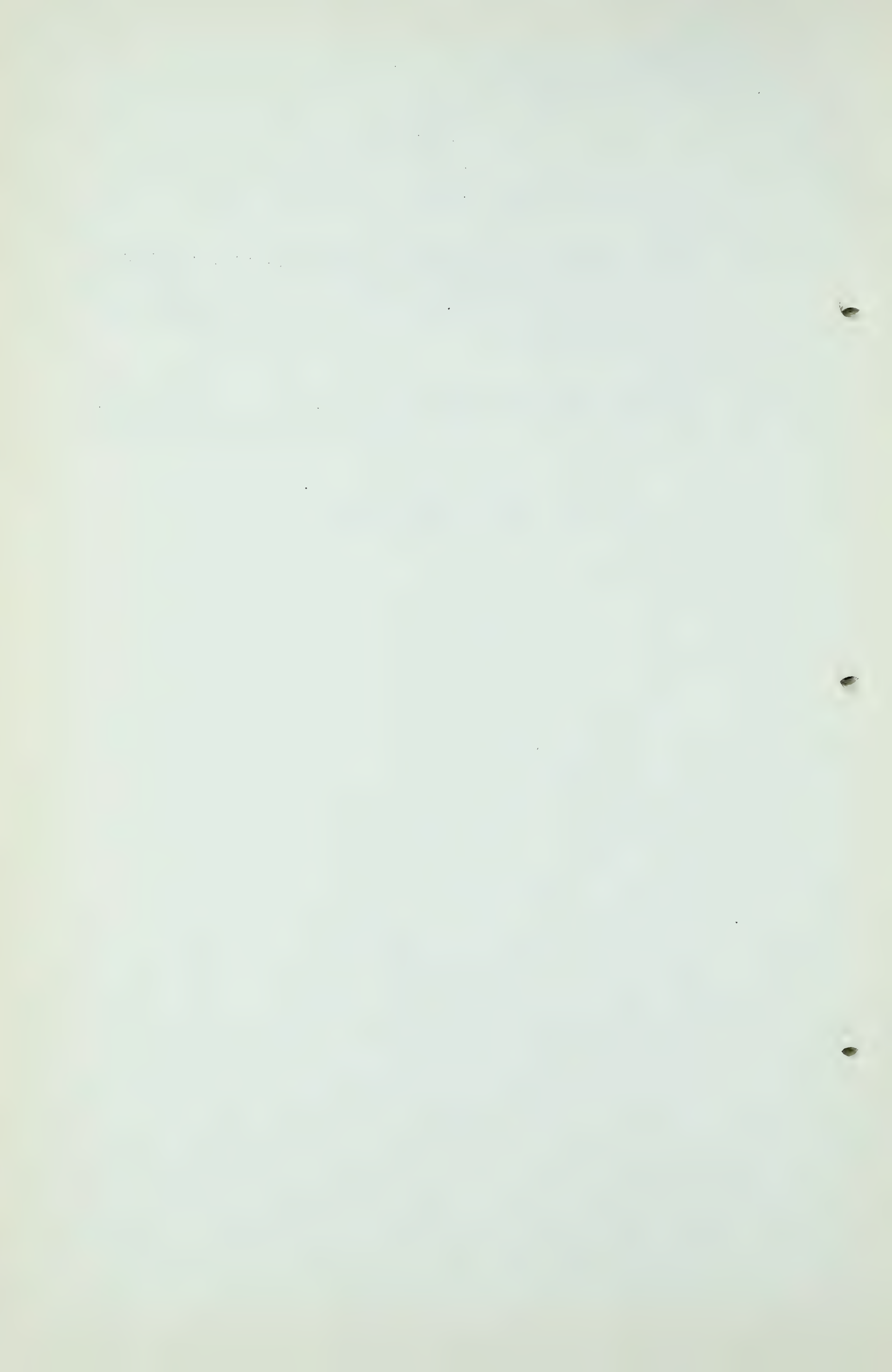
Q Yes?

A And I think it is at a price now where it is competing with coal. For instance, some of the coal plants are putting in gas.

Q Yes?

A And they would not do it unless it was as cheap as coal.

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Q So that it is a matter of competition as between the two types of fuel, and if the price of gas was not cheaper than coal you would advocate coal and fuel oil or diesel?

A I think that is the way it would have to be. If gas were not cheap enough it would have to be developed by coal.

Q And then you said that hydro --

A Well, hydro is the cheapest power for some time to come.

THE CHAIRMAN: Thanks, Mr. Russell. There will be a short recess.

(At this time there was a short adjournment.)

RALPH E. DAVIS, Recalled.

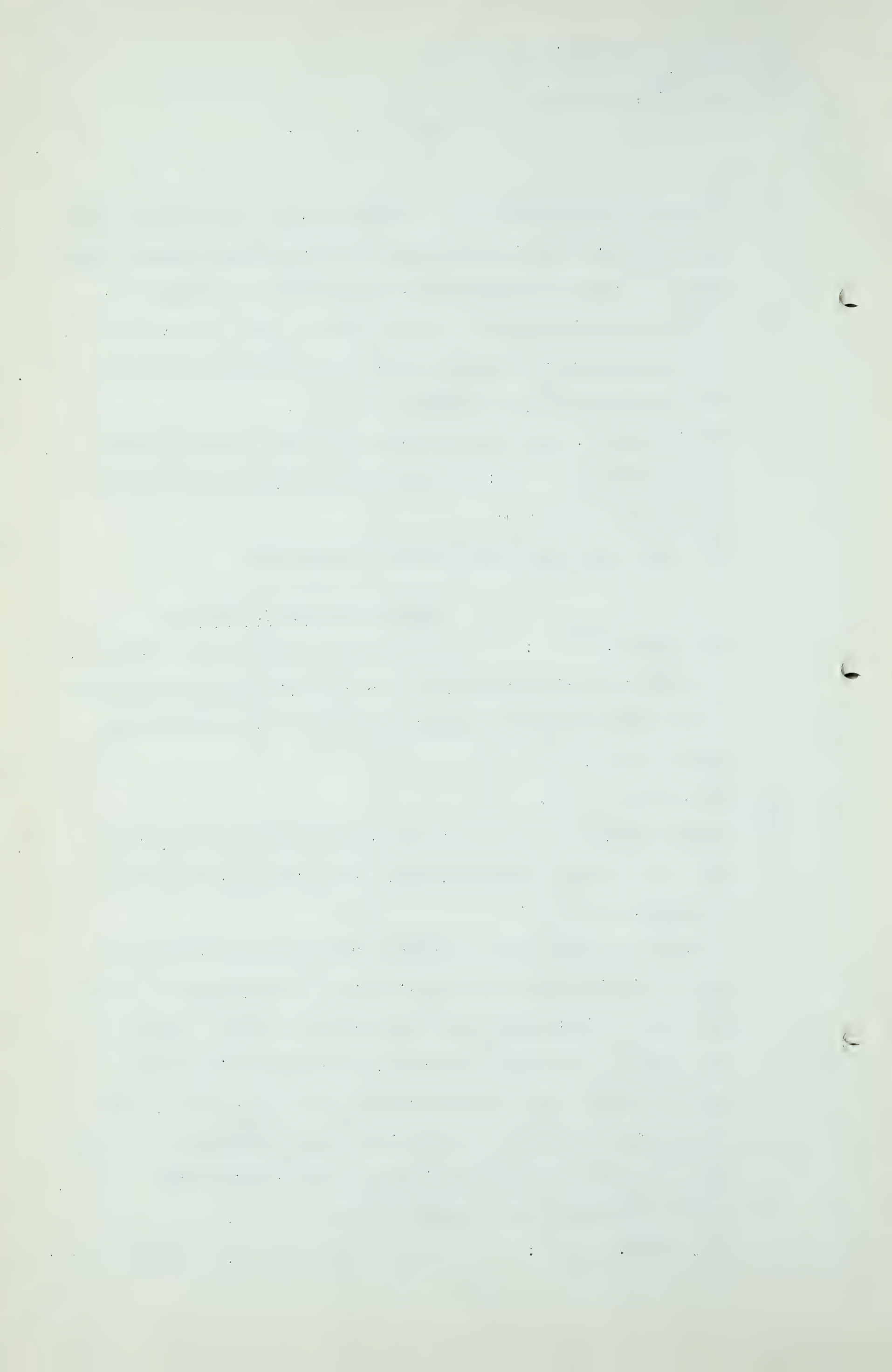
Q MR. STEER: Mr. Davis, in going over Exhibit 6 yesterday, we omitted to deal with areas south and southeast of the Foremost field and that includes the Pakowki Lake area, does it?

A Yes, sir.

Q I would like you to discuss with the Board, if you will, just for a moment, that Pakowki Lake area and also the Princess field.

A I will say regarding the Pakowki Lake area, in which I include the Pendant d'Oreille field, the Manyberries field, the Smith Coulee and Black Butte fields, I had occasion to make what I considered a detailed study of those fields and the report was prepared dated June 18th, 1949. I am only going to mention it because of the conclusion I reached that the total gas in that area was 250 billion feet, the total recoverable gas in those fields.

Q DR. GOVIER: Is that referred to in Exhibit J-6?



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MR. STEER: Yes, sir. It is not referred to specifically but it is included in the gas potential in this area south and southeast of the Foremost field on page 19, sir.

A That I stated to be recoverable. I believe the initial gas in place in these several fields was estimated at 340 billion and the recoverable at 252 billion. The portion of that 252 billion controlled by McColl-Frontenac and Union Oil Company together is about 240 billion. That is all I have to say about it unless there is some other question.

Q What about Princess?

Q THE CHAIRMAN: Before we proceed to Princess, the field that is also known as the Pendant d'Oreille field with four or five producing wells, is that the one that is referred to in the Pakowki Lake area?

A I think it may be that my pronunciation is not correct but I say the fields included here are the Pendant d'Oreille--

Q The Pendant d'Oreille?

Q MR. STEER: I think you also said the Pendant d'Oreille and Manyberries?

A And Smith Coulee and Black Butte. I am not familiar with the more recent development but I have been told a new well was drilled in that Manyberries area and that it does extend the proven area somewhat.

Q THE CHAIRMAN: This 250 billion feet of recoverable gas includes Pendant d'Oreille, Smith Coulee, Manyberries - -

A - - and Black Butte.

Q And Black Butte?

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A Yes, sir.

Q MR. STEER: Now a word on Princess.

A I had occasion to study the Princess area in 1947 and made a report on it, dated November 29th, 1947. Princess was referred to by me as a large area embracing something like 2000 square miles. Quite a good many wells have been drilled, scattered around in the Princess area.

Q MR. S. B. SMITH: Is that referred to in Exhibit J-6?

MR. STEER: No.

A The results of the drilling I would describe as having been disappointing. They had a few oil wells that had small production and for rather a short time, but did not justify apparently very much further development. The same may be true for gas because most of the wells drilled have been abandoned. I do not regard the Princess area as affording today any pipe line gas. The wells are too small and they are too far apart. It would not, in my judgment, be an economic matter to build the lines necessary to gather the gas.

Q That is all, sir.

CROSS-EXAMINATION BY MR. FENERTY:

Q Mr. Davis, I note on pages 6 and 7 you referred to the gas in the Viking-Kinsella field and I note that you figure on 150 wells. That is the Kinsella, is it not? Wells, to an abandonment pressure of 200 pounds per square inch gauge, with a reserve of 612.5. Now you have told us, and we all know, of your long familiarity with these fields. I take it, and I want you to tell me whether I am wrong, that in giving

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us these figures you feel the result of what has happened in the past and what you know about water and all those things that have to be considered, that 150 wells is the maximum economic number that might reasonably be drilled to give you the economic result and that 200 pounds gauge pressure is the minimum pressure for economic results of abandonment. Is that correct, on an economic basis?

A Well, I would not fight with you if you said 195 pounds, but I am saying that I think that gas taken out down to a well head pressure, average through the field of about 200 pounds gauge reading, that gas taken out after that will be in small daily and annual amounts and it will be expensive gas.

Q That is what I gathered and that is why I said economic and if I in, we will say, ignorance or something, came to you and said "You have not got a problem here. Why, this 612.5 we will fix that and we will put in double the number of wells and we will take her out down to 14 pounds or even zero on the gauge." What would you tell me in answer to that?

A Since the Kinsella field is not affording gas to the City of Calgary, I would say you could promote that idea, but if it happened that you were interested in the City of Edmonton I would tell you the gas was going to cost you about \$2.00 a thousand. You would not like that.

Q And you would tell me that I did not know what I was talking about and then proceed to show me why?

A No, I do not know that I would tell you that. I have already told you the gas will be expensive if you try to

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take delivery out in small amounts from many wells. You suggest 300 wells. That is not reasonable. But in a region where it is believed there is a notable amount of gas still undiscovered, I think that before we can take gas under 200 pounds from Kinsella to Edmonton, the Edmonton market will be supplied largely with gas from other sources. And because we have the wells and we have the gathering system, we will continue to use it for what it is worth and maybe take the gas down to 150 pounds. That is getting close to the place where, in general experience in gas fields, wells are abandoned. I told you yesterday I averaged 36 depleted fields and showed the final abandonment at about 87% depletion. Take this down to 200 pounds and you are somewhere around 78 or 80% depleted. That is a long way to go with a field like Kinsella, where the sand is so thin, 7/8ths on the average.

Q You tell me now that to do what I suggest to you might be possible at some stage but the Kinsella gas would cost more?

A I say it would be very expensive gas if it all came from a field like that field would be, when it gets down to under 200 pounds, but if most of the gas were coming from a new field with high pressure the price of the gas would be related to the over-all cost, and a small amount of gas costing a dollar or two and a whole lot of gas costing 25 cents - -

Q It would be much better to get that gas from the new fields with high pressure?

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A I would think so.

Q Then for instance let me ask you one thing about compression gas. Suppose you take it down to 14 pounds absolute, and you know that engineers generally figure on a compression perhaps being something less than double the pressure they are dealing with?

A The compression ratio, if it be - if you had gas available with enough compressors, at 100 pounds, I think it would be rather a nice operation to raise it up to 250. Or put in two-stage compression. But if you ever got this gas down to going into the neighbourhood of zero well head gauge pressure, you won't have enough gas coming into your compressors to amount to anything.

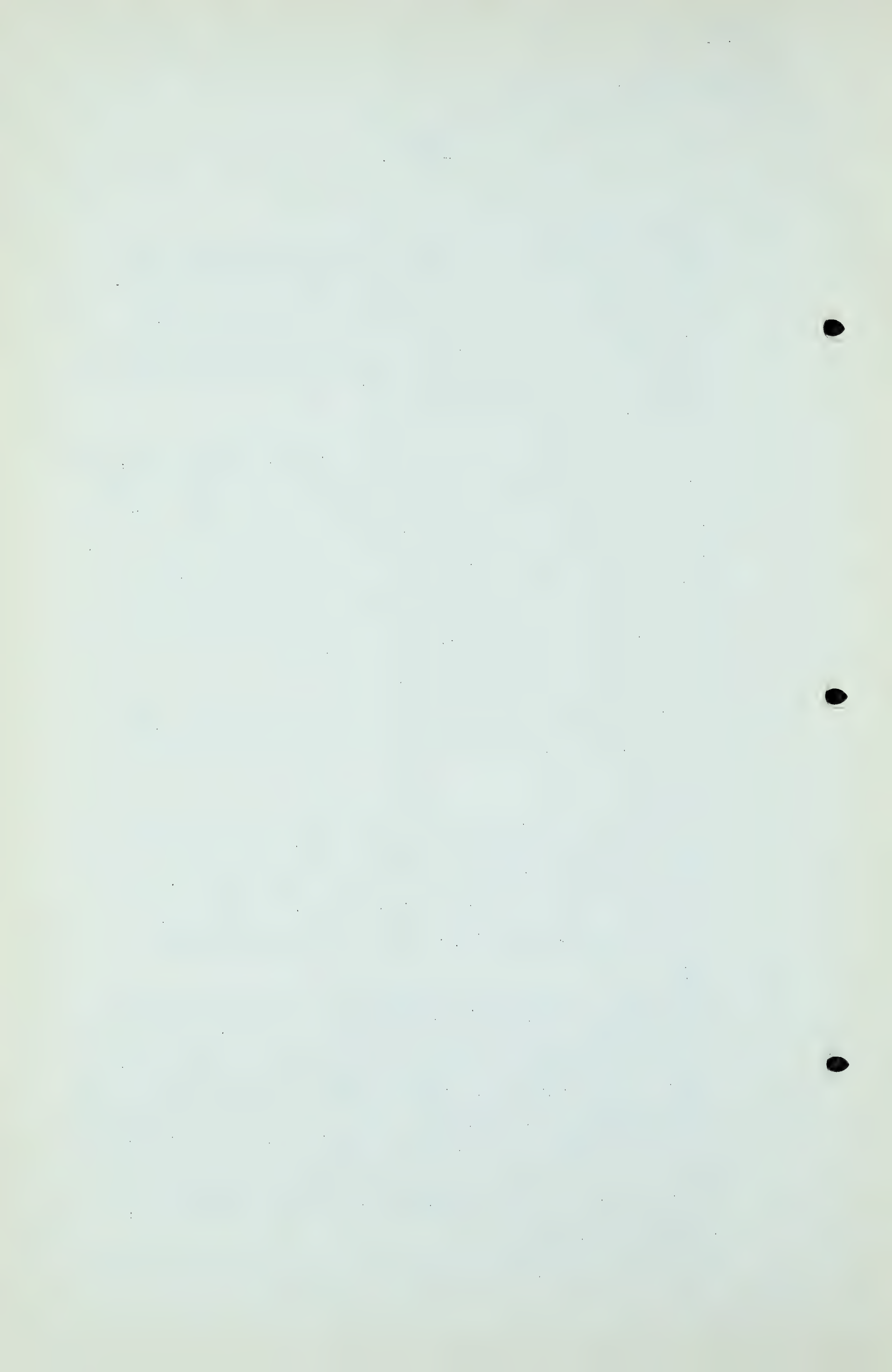
Q You could build a gas pressure up from 14 to 28, from 28 to 56, from 56 to 112 and so on. Is that an expensive operation?

A It is and it would eat up pretty nearly all of the gas that came out of the well to do that. Let me say this, however, that there are fields operating where the pressure, when the wells are closed in, is not more than 10 pounds.

Q Yes?

A There are such fields in operation. They are, of course, operated along with a good many other sources of gas, so that the high cost of a little stream of gas does not have much influence on the final cost price. A field like that one that I like to refer to is the Marysville field east of Pittsburgh, where the suction into the compressors is actually a vacuum.

Q With your knowledge of gas in Alberta at this time have



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you any reason to offer why the City of Edmonton should contemplate the use of, we will say, \$2.00 gas from Kinsella?

A No, sir, I do not. I am sorry I mentioned that.

MR. NOLAN: Mr. Chairman, may I say that the evidence that has been given by Mr. Davis and the evidence that we propose to give on the question of reserves and deliverabilities are not materially different. If there is any difference in our approach to this study of reserves and deliverabilities we will advert to that in our own evidence at this hearing.

CROSS-EXAMINATION BY MR. McDONALD:

Q Mr. Davis, would you be good enough to refer to your diagram or approach flow graph on page 21 of Exhibit J-2?

A Yes, sir.

Q It has to do with Kinsella well No. 30?

A That is right.

Q I would just like you to give me some information from this chart so that I can compare it with some other evidence that has been put in on the record with regard to this field. Can you tell me what is the maximum open flow, or the open flow according to this chart on this particular well?

A I am not very familiar with that chart, as I told you yesterday. I believe it to be about between 7 and 8 million feet.

Q My calculation of it, that is taking the original pressure in the field at 728 pounds - -

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A All right.

Q - - and taking the points on your chart at around 450 pounds, and taking the Number 2 of these lines, the upper one, comes to .55 million per day, and since this is an hourly chart you multiply that by 24 and we arrive at 13.2 million cubic feet per day as being the open flow at that pressure of 450 pounds, or roughly. Now if you could accept my calculation as being right - -

A I have no objection to accepting your calculation but I would like to ask Mr. Paterson to inform me of the correctness thereof before I say. I only presented this graph at the Board's request for such a graph. Is Paterson here?

MR. PATERSON: Yes.

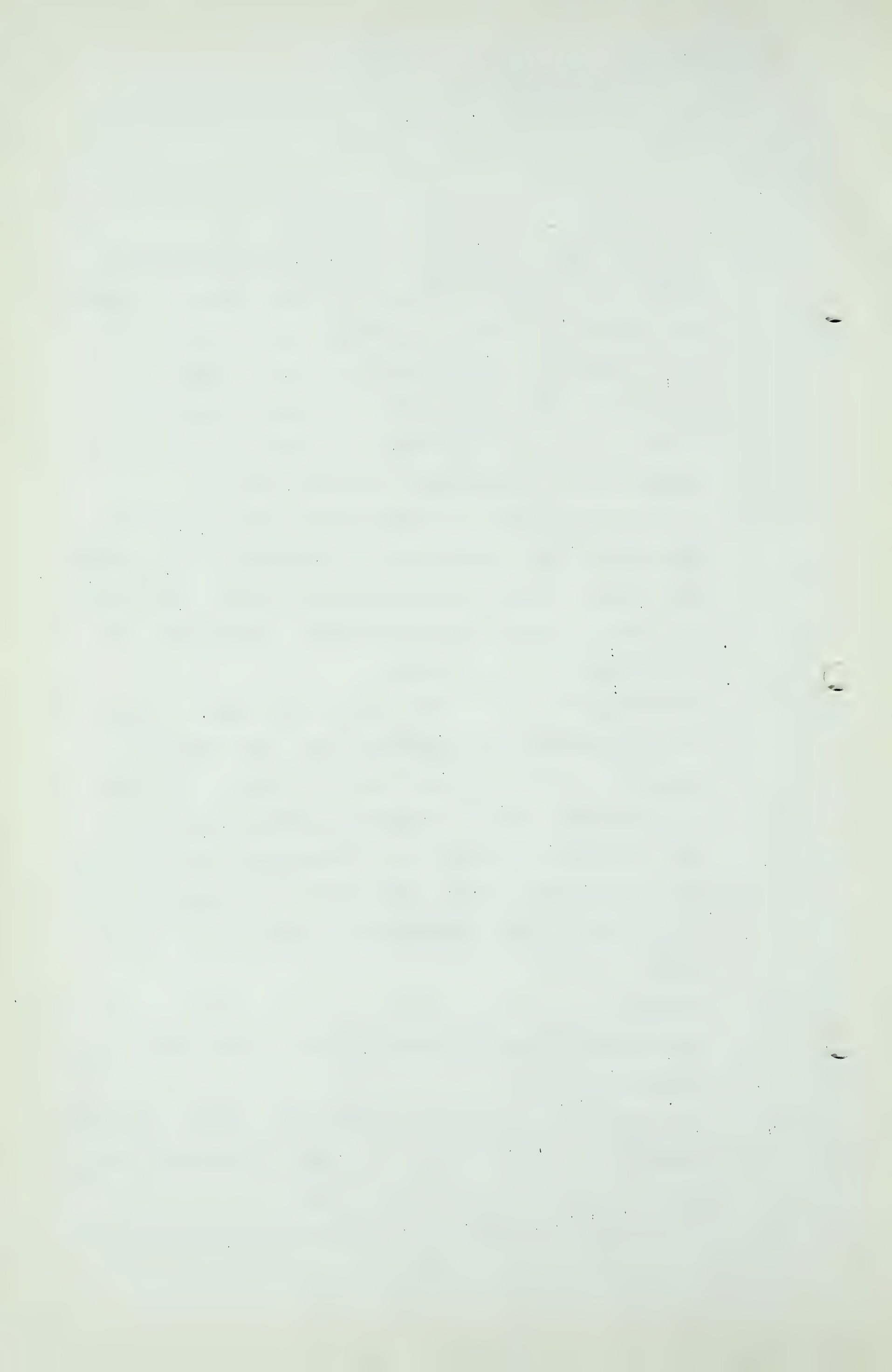
Q MR. McDONALD: Mr. Davis, if I might - I have had the opportunity of speaking to Mr. Paterson and I outlined to him the calculation I had made on the chart, and taking the second line marked 2, which is a 10-day test, and using a pressure of 728 squared originally at about 450 pounds, we have .550 million per hour multiplied by 24, gives us 13.2 million per day open flow at that point?

A All right.

Q The only point I want to make of that, you use your formula $M = .86$?

A This graph, the points were determined by actual flow tests and plotted and this slope of the graph is measured and is found to be 0.86 as a result of tests.

Q I just explain to you, you may or may not have looked



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at it, the calculation made by Ford, Bacon & Davis and put in evidence in their hearing with regard to the Kinsella field on the same point, and on the figures I have given you, open flow calculated on the average well taken on the average of the field is 10 million Mcf, and they use a figure of $N = .87$, the material which was given to them indicated it was just that?

A All right.

Q Would you say that would be the fair average for the wells in both the Kinsella and the Viking fields?

A It seems to me that their average open flow of the order of 10 million, I believe that is about right. I do not have the recent average figures. I think that is somewhere close to what is correct.

Q Now, I explained to you further that Dr. Hetherington stated the reason he did not take your figure as you have it here is that he thought Viking-Kinsella, the Viking side of the field might be a different type, the wells might be lower in the Viking side and therefore he took an average of 10 million feet throughout as being the open flow?

A He thinks the wells on the Viking - which is the old part of the field - that those wells today might be lower than the newer wells on the Kinsella side. That is his point?

Q Yes.

A Yes, that is right. But what they will all be 15 years from now is another thing. I only hope that the Kinsella field will do as well through the years as the small portion of the field which we call the Viking, has done. I



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hope it will do as well.

Q Will you agree with me, though, that the calculation as I have outlined it to you, is a fair calculation of the deliverability from that field, on the information that is now available?

A I don't think it matters at all, sir. It is satisfactory to me.

Q And now will you take page 9, a sentence at the top of the page, Mr. Davis? You state: "The economical drilling programme at Kinsella will probably of necessity be completed before the year 1960, and after that time peaks can be met from the two fields only, if Leduc gas cap wells be used to the extent necessary on peak days." Now, I wanted to ask you in arriving at your conclusion there did you contemplate that the oil and gas production from the Leduc field would be a steady supply to the market? All the way through? It would be a base load?

A To the extent the oil field gas is made available to the Northwestern Utilities, it may be a fairly steady stream of gas. I would expect it to be fairly that way. We know, of course, in operating oil fields we have every sort of operation. In Texas where the Railroad Commission gives a field a certain allowable production, sometimes one company operating in the field thinks it to their interest to operate the wells for 15 days and shut them in for 15 days. Some other company operating in the same field and owning a gasoline plant prefers to string it out over the whole 30-day period. I should think at Leduc, Imperial Oil Limited and other operators would, in the course of development of

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their programme, find it desirable to keep the gasoline plant in as nearly constant, uniform operation as is reasonable and that would afford Northwestern Utilities a fairly steady stream of gas, which could not be called upon for any peak requirement occasioned by sudden cold weather. It does seem to me this way that when the time comes that the peak cannot be met by the Kinsella from an economic number of wells and economic compressor installation, and cannot be met with the additional oil field gas at Leduc, that with that large gas cap present that gas could be put into the line for a period of a few days, a week or 10 days, or whatever the time period was, which would take care of the important situation of the market, and at the same time have a very minor effect upon the ultimate recovery of oil. Take 50 million a day, just for example, out of a gas cap for 20 or 30 days and doing that year after year, when the time comes I do not believe that it would have a substantial effect upon the final recovery of oil. It would be bad practice to start in taking 200 million feet a day out of that gas cap and leave the oil behind. That has already happened at Turner Valley, that we know. It must not happen again. I do not believe it would be a serious matter to take relatively small amounts of gas during periods of peak requirements.

Q Yes?

A I assume that that gas would, in peak times, be made available in the public interest.

Q Then there was one other point with regard to Leduc,

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Mr. Davis, you mentioned the Lower Cretaceous gas as being, possibly being available throughout the different parts of the Leduc field. You have not included that, any estimate of that made in the figures?

A That is correct.

Q At the same time would it be your judgment that as and when required in the course of the history of the field that with the wells being in existence that gas could be at that time produced and will be marketable?

A I would think so. That gas will be taken when the time comes. It may be taken for purposes of peak delivery, within 10 years, instead of the gas cap gas. That is possible.

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Q It is a source of gas?

A Certainly. It certainly will be.

Q THE CHAIRMAN: Mr. Davis, might I ask a question with regard to this matter Mr. McDonald has brought up about producing the gas cap. Can you put the gas cap gas right into the gas company's line? Wouldn't it have to go through the processing plant at Leduc and you would be limited by the capacity of the plant unless you could take the gas cap gas right into the company's line? Could that be done?

A It would seem this way to me, sir, that the need for doing such a thing would have been foreseen and the equipment necessary for taking the stream would have been placed ready for operation, otherwise it would be possible to put certain types of market on a stream of gas that required no treatment and a separate line to handle them.

Q You think it could be used without being processed?

A Well, only in case that it went to the - - see, the Leduc gas, I am told, runs 1200 or better Btu's, and it would cause a little trouble to suddenly shift the thing in one part of the town from a 1000 to 1200 gas. There would have to be plans made to handle those things.

Q This 1200 Btu gas is after it is processed. Would gas from the gas cap have a higher Btu content?

A I do not know too much about what that gas runs before it is processed but I am assuming they would take out all liquids and the separator would take it out.

Q I was wondering if that gas could be utilized from the gas cap without being processed?

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A I think it depends how far we mean to go and what we mean by "processed". I do not believe it would be necessary to take out the full stream of liquids that the company would be taking out but it would be desirable to reduce its Btu's if we are going to mix it in the city plant with gas.

Q MR. STEER: How would you reduce it?

A Well, in the first place the separators would take out a portion of the liquid. It would depend upon the quantity of this gas that would be required to be used, but it would need to be brought down to some reasonable limit, not down to 1000, as I believe the present plans would call for, brought down to 1100 maybe. That is an engineering problem which can be worked out. I am only looking here at the source of the gas needed. We have at Leduc a large volume of gas that is not available in its entirety for a long time, but I think we can call upon it for peak needs if we have to.

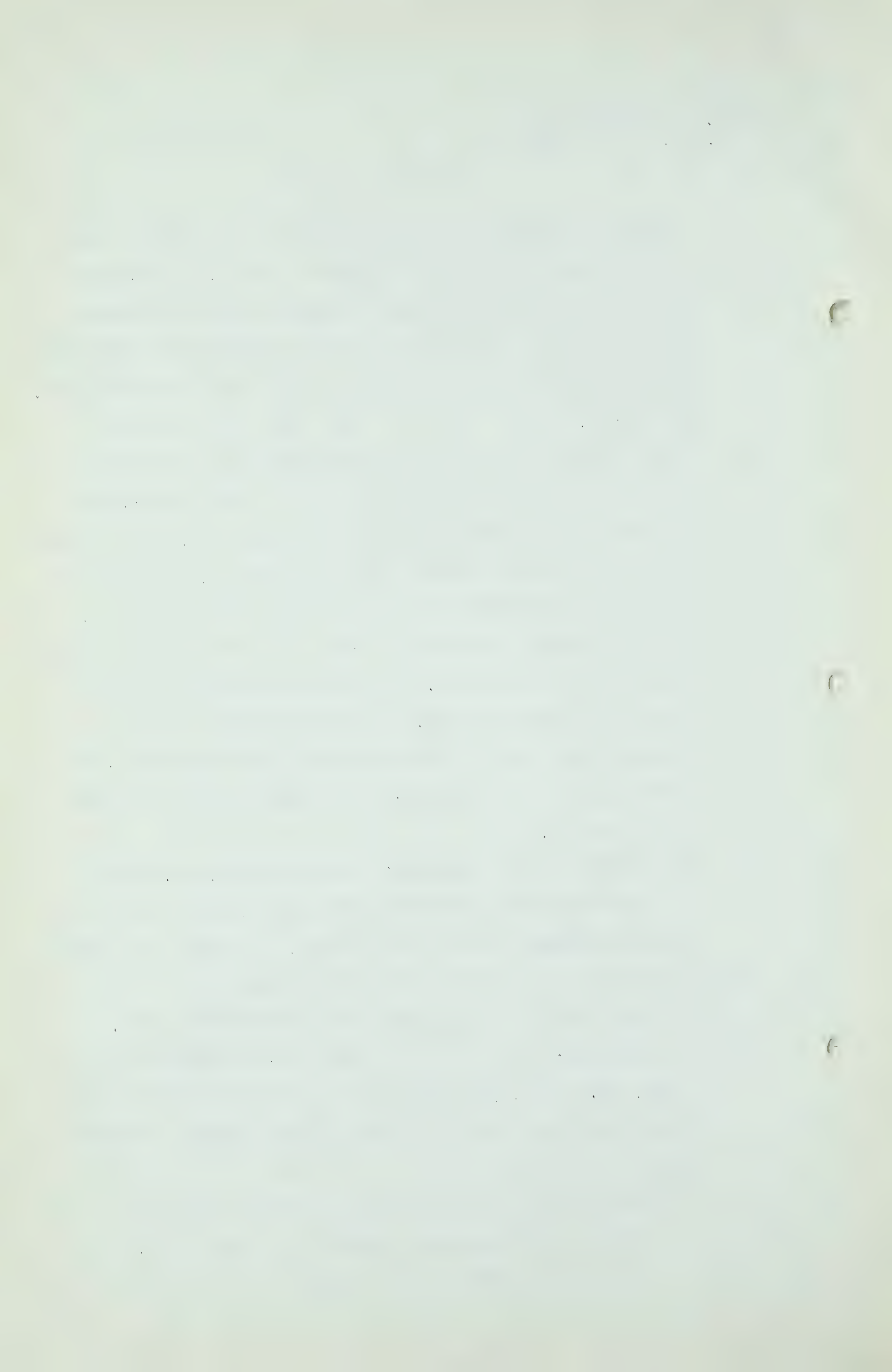
Q Your answer to the Chairman's question then, Mr. Davis, is that with proper treatment that gas can be used without passing through the absorption plant. Is that your answer?

A I think that it can be used if the volume of it be not too great without going through the absorption plant.

Q MR. McDONALD: Just dealing again with Leduc, Mr. Davis, you mention in your conclusion to your report that the plant at Leduc, now the Imperial gasoline plant,

"yielding a stream of about 10 million cubic feet daily of stripped gas available to market use.

This may be expected to increase somewhat, and



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"Northwestern Utilities is preparing to handle the gas thus available."

Now, can you tell me, in arriving at the conclusion on page 9, did you take into account the increase or the expected increase in that supply from Leduc as a base load from 10 million cubic feet up to what figure, and could you tell us the figure you had in mind?

A There is no way of judging what amount might become available. This stream of gas may be used for repressuring certain wells in the general vicinity where gas is required, probably required for better oil recovery, and it is quite possible that there would be a small quantity of gas from the gasoline plant available, not much larger than the stream now flowing. That is one of the possibilities. The other possibility is that they will not find it feasible or desirable to use this stream of gas for repressuring their wells and that the quantity might double or treble within a few years, and since I can not judge what that might develop into, whether it is going to be 10 million a day or 20 or 30, it would have this effect, Mr. McDonald, if it be 10 the time is shorter when we need a new supply, and if it be 30, then the time is that much longer, somewhat longer. The broad conclusion which I reached would not be materially affected by whatever that program developes into.

Q 1960 may be the minimum, it might be '65 under other circumstances?

A It could be.

Q All right, sir. Now, I do not want to go into this with



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any detail, Mr. Davis, but I notice in one of the exhibits filed in estimating the remaining reserve recoverable for marketable reserves in the Leduc field, they used the figure 712 billion cubic feet to 100 pounds. Now, that is contrasted to your calculation of 612 billion cubic feet to 200 pounds. Would that be your judgment, 100 pound basis, that 712 would be a reasonable estimate of the field?

A I have used, I believe, 600 and something down to 200. The question then is how much it would be down to 100?

Q Yes?

A Well, I doubt if it would go up to over 700. I do not think there would be much difference but it would be more, of course.

Q Well, my calculation would be in the neighbourhood of 700 pounds. I wondered if you would agree to 700 pounds?

A I would not have any fight about it. Of course, if you want to get right down to the calculation, we could calculate it out but I do not think it matters that much.

Q No. Another thing about your reserves at Viking-Kinsella, did you include the Ranfurly well that was drilled on the northwest part of the field in your overall calculation of the field? I do not think it was in production at the time you made your original report in 1948.

A I do not recall the well at all. If you tell me what township and range and section it is in, I might. Can you find it on that map?

Q No, it is not on your map, at least, I do not think it is.

A Well, Mr. McDonald, the map that I present indicates all



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of the area that I did include and you can answer the question by finding your well.

Q Well, you do not recollect having given consideration to it?

A I do not. Is it any sort of a well? Is it a good well?

Q Well, it was referred to by Dr. Nauss as coming into production in February of this year. I was wondering if you had taken it into account.

A It would not have influenced the answer 1 per cent, even if I had.

Q Now, Mr. Davis, we have in the reports a reference to the transaction between the Imperial Oil and the Northwestern Utilities Limited with respect to the Northwestern Utilities Limited acquiring title to the petroleum and natural gas leases covering the estimated reserves of 278 billion cubic feet?

A In the east end of the Kinsella field?

Q In the east end of the Kinsella field, yes.

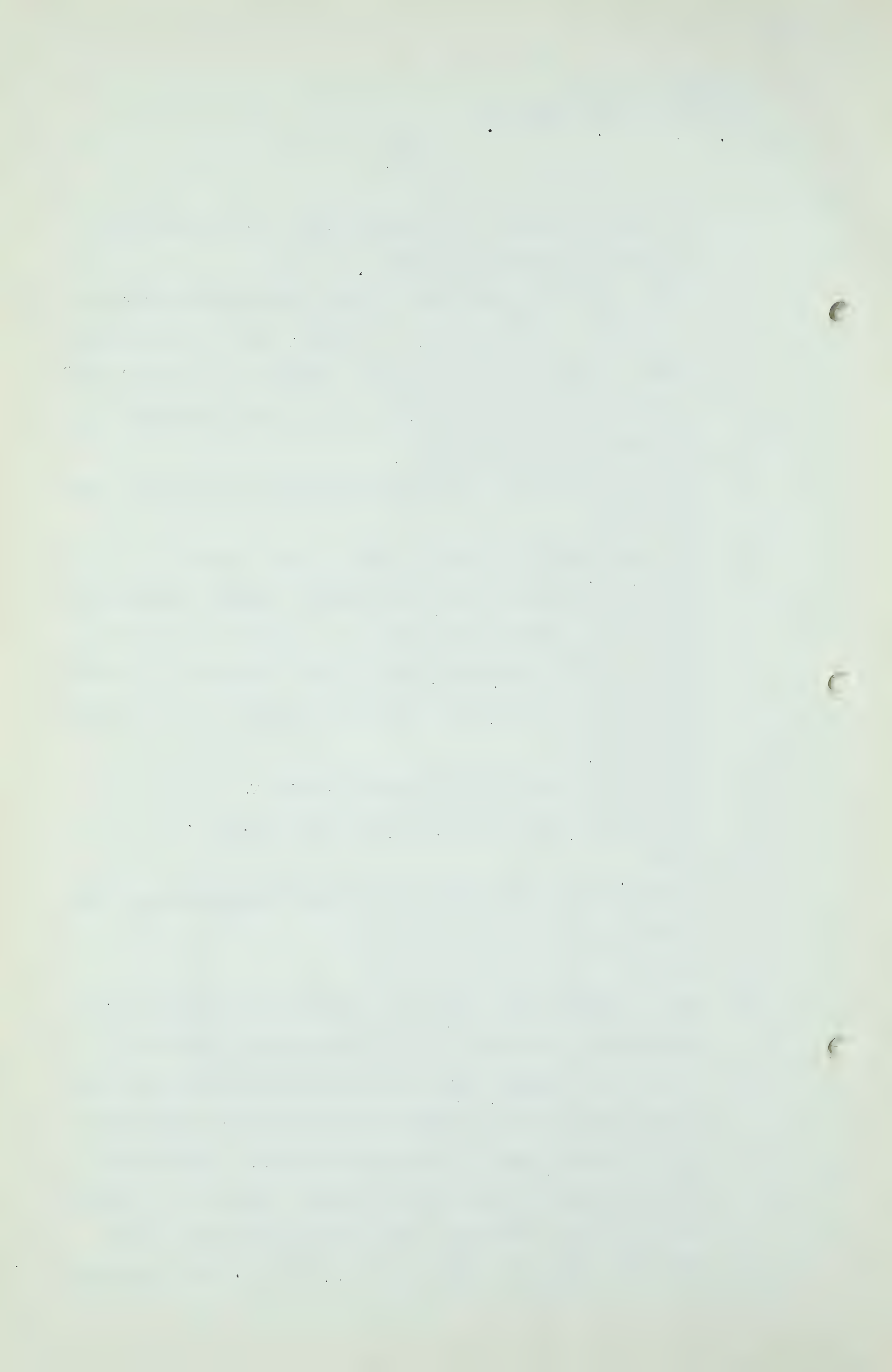
A Yes.

Q I presume you were familiar with that transaction at the time?

A I was.

Q And I presume, too, that you consider it a reasonable transaction on behalf of the Northwestern Utilities?

A I went all through that and Mr. Milner consulted with me a great deal and the detailed report that you had presented here was made in connection with the proposal to buy those gas reserves, and I think I can say this without being unfair to anybody, I told Ray Milner that I did not feel like going above \$3,000,000.00 on that purchase.



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It was going to be up to me to write the report on which the money would be borrowed and I did not care to be paying 4 or 5 million dollars.

Q The net result was that the purchase was \$2,890,000.00?

A I think so, yes.

Q You felt that was a fair price for acquiring that amount of reserves for that particular system?

A What do you mean by "fair"?

Q Well, what I am getting at is that that 278 billion cubic feet gives roughly 1 cent a thousand cubic feet to Northwestern Utilities, isn't that true?

A That is about what we paid, isn't it? Well, when we got that trade made I thought we had made a good trade, is that what you mean?

Q Yes?

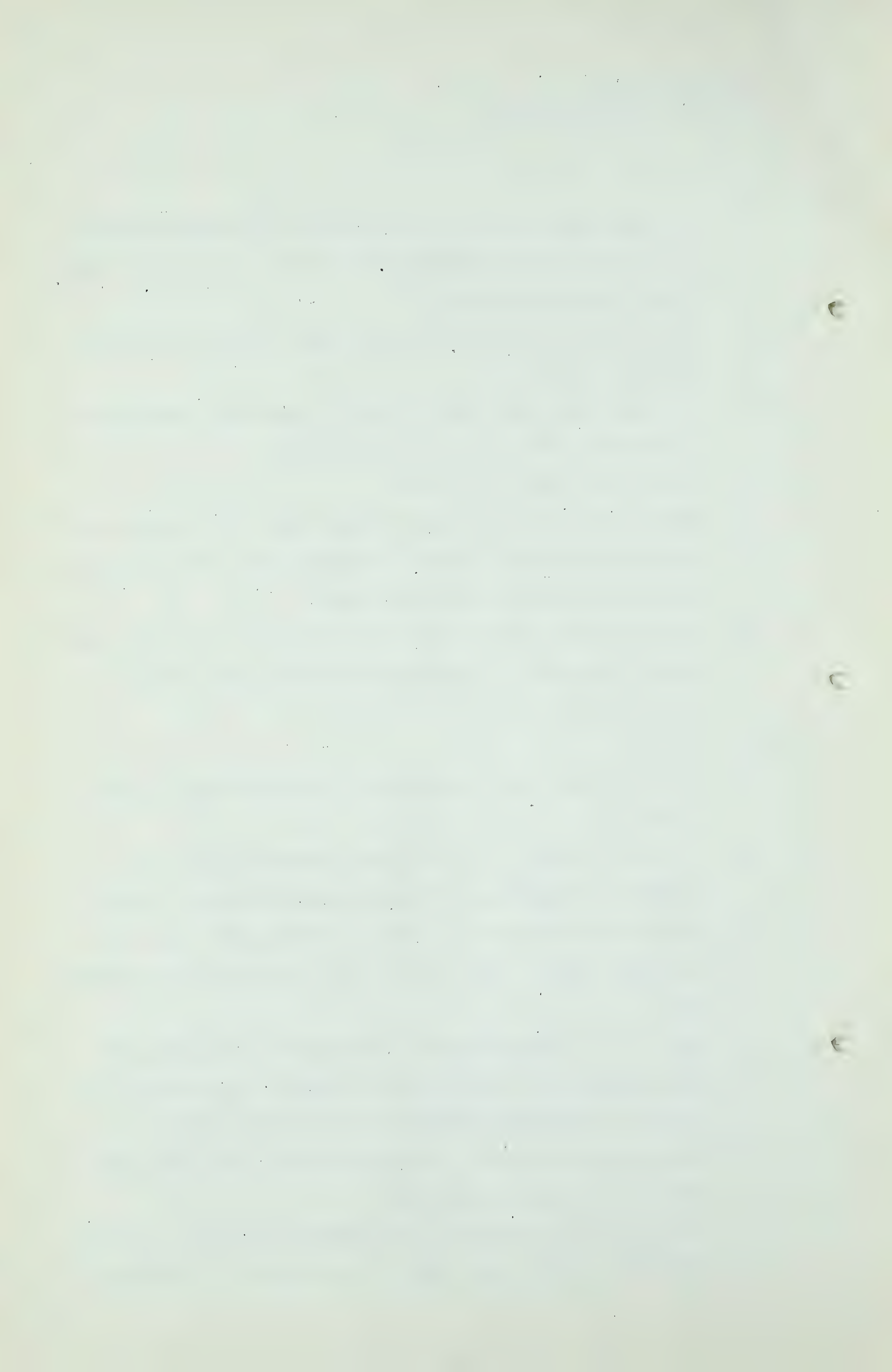
A I do not know what the Imperial people thought, I never cared.

Q I am just coming to the recommendation that you are asking or suggesting to Northwestern Utilities Limited that they acquire, well, within a very early date, as I read your report, 500 billion cubic feet more of reserves?

A Yes.

Q Now, is it a fair judgment on my part to say that that 500 billion cubic feet reserves should be acquired if it could be acquired at \$5,000,000.00, which would be practically equivalent to the price you paid last year for it, or this year for it?

A Well, there are several things which influence a judgment on that. In the first place, the location. It might be



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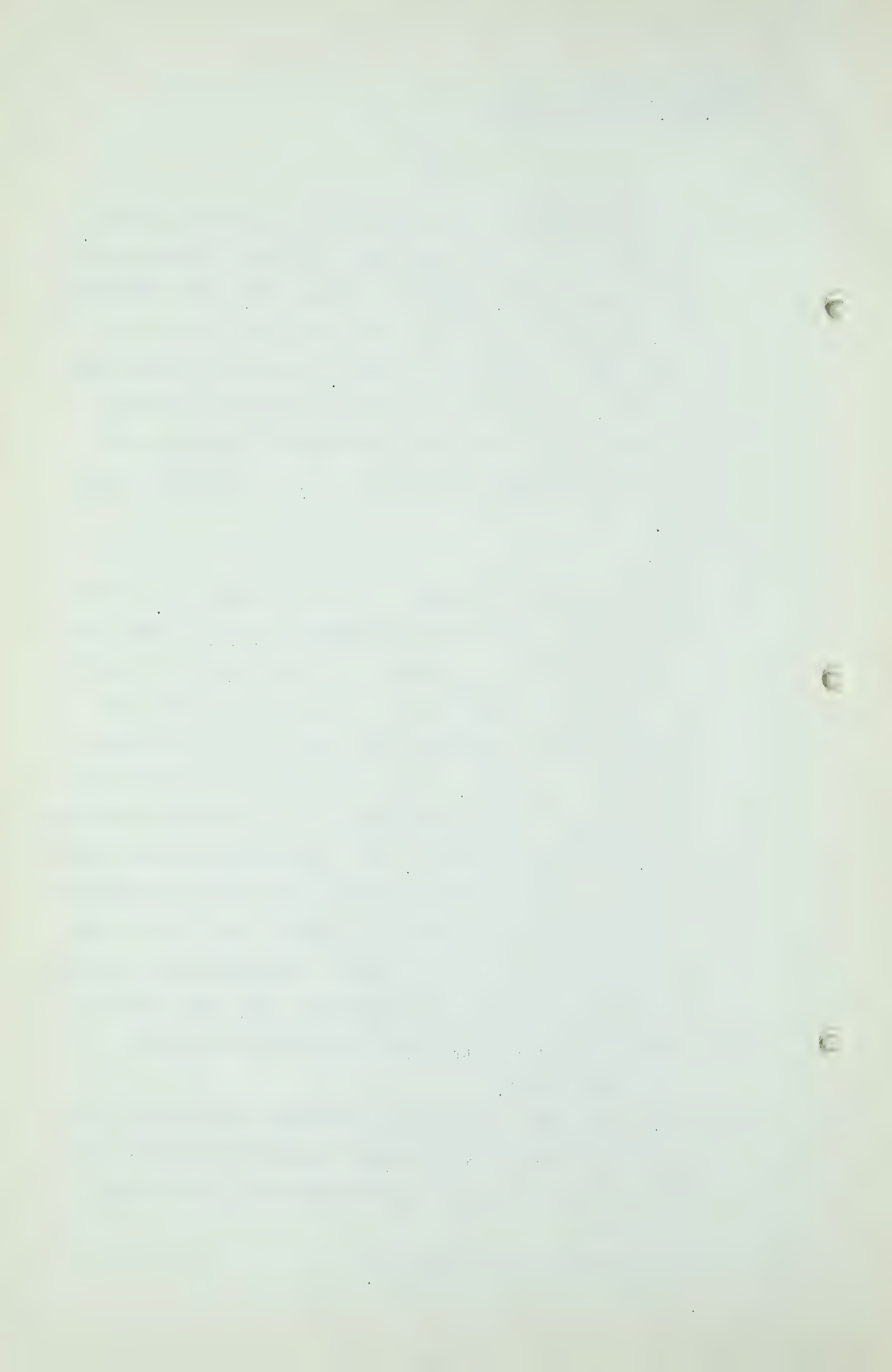
100 miles away and that would make it less attractive. It might be 400, 300 pound gas. It might be sour gas or wet or sweet gas, a good many things that would influence me. And there is another thing, what gas is worth in 1951, what it was worth in 1948. Gas might be worth more or less. I would not say that what was paid for the Kinsella Imperial gas would control my thinking at all if a new opportunity to acquire 400 or 500 billion came up.

Q Yes?

A It would depend on how well I liked the reserve. If it was one that would involve a minimum number of wells for its development as compared to a large number. I would pay more for a reserve where the sand was 30 feet and equally porous, equal pressure, than for a field where it was 15 feet thick. To get the gas out of the second of those two examples would require more miles of gathering line, probably more wells, and I just think I would like to have my gas more concentrated than the gas is concentrated in this Kinsella field where I believe that our recovery will be something on the order of 3 million feet per acre. If you get 10 million per acre and at the same depth so that the wells cost the same the gas would be worth considerably more.

Q Yes. Now, what you have said relative to my example of the Northwestern Utilities would apply in principle to the acquisition by the Canadian Western of additional reserves?

A In principle I would think so.



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Q And you recommend specifically that the Canadian Western acquire 750 billion cubic feet in a relatively short time, within the 10-year period?

A I think that is a desirable thing whether they buy the gas in the ground or whether they contract for the purchase of the gas, one or the other.

Q Yes. Well, the reason I wanted your comments on it, Mr. Davis, was so far as I recollect, and you might correct me, that this is the first time in Alberta where we have had this type of a sale and purchase by a utility company of gas in place as a reserve for future production, for future use.

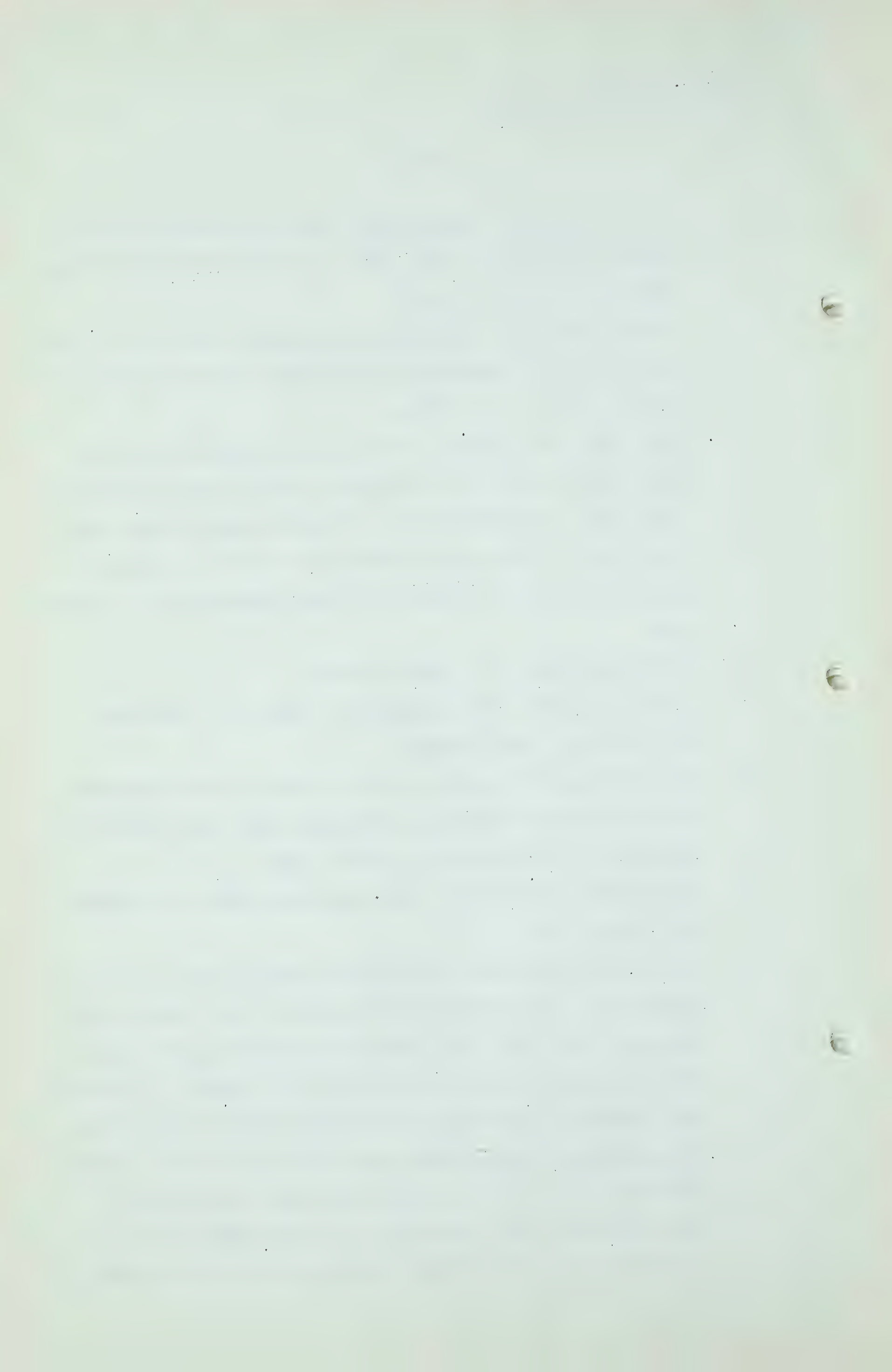
A Referring now to the Imperial deal?

Q Yes. It is the only transaction I know of in Alberta. Do you know of any others?

A It stands out as a large deal, but what is the difference between that and buying an individual well and lease? In principle, no difference, just in size.

Q Except that the reserve being purchased here is a reserve for future use?

A The reserve purchased here was for today's use as well as future use. The thing that was going on out there in the Kinsella field was this, Imperial had spent some money, they had drilled some wells, they had a reserve. They may have planned to use that gas in some sort of a manufacturing process. They may have had that idea in mind. That idea did not stand up too well when they found Leduc. The property became available at a much lower price than it would have been available at had there been no Leduc



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oil field found or any other big oil field. Of that I feel sure. Now, their gas was being drained to some extent by the Northwestern Utility wells, to some extent, and I know that Mr. Milner recognized that it would be a proper thing and we discussed one or the other of two things, buying the gas from Imperial in Kinsella more or less rateable, or buying the gas in the ground. We did not feel that we could pay them the kind of a price for gas at the top of the well which would suit them, but we were able to make the deal you know about. You can not blame us if we made the best deal we could.

Q Yes. Now, you could tell me this, too, if you know it, my understanding is that the Hudson's Bay lands are subject to a payment of 5 cents per thousand?

A Yes.

Q The gas recovered from them, is that correct?

A I won't vouch for that because I do not remember.

Q You do not remember. And that the C.P.R. lands are subject to a royalty of $12\frac{1}{2}$ per cent, or do you recollect?

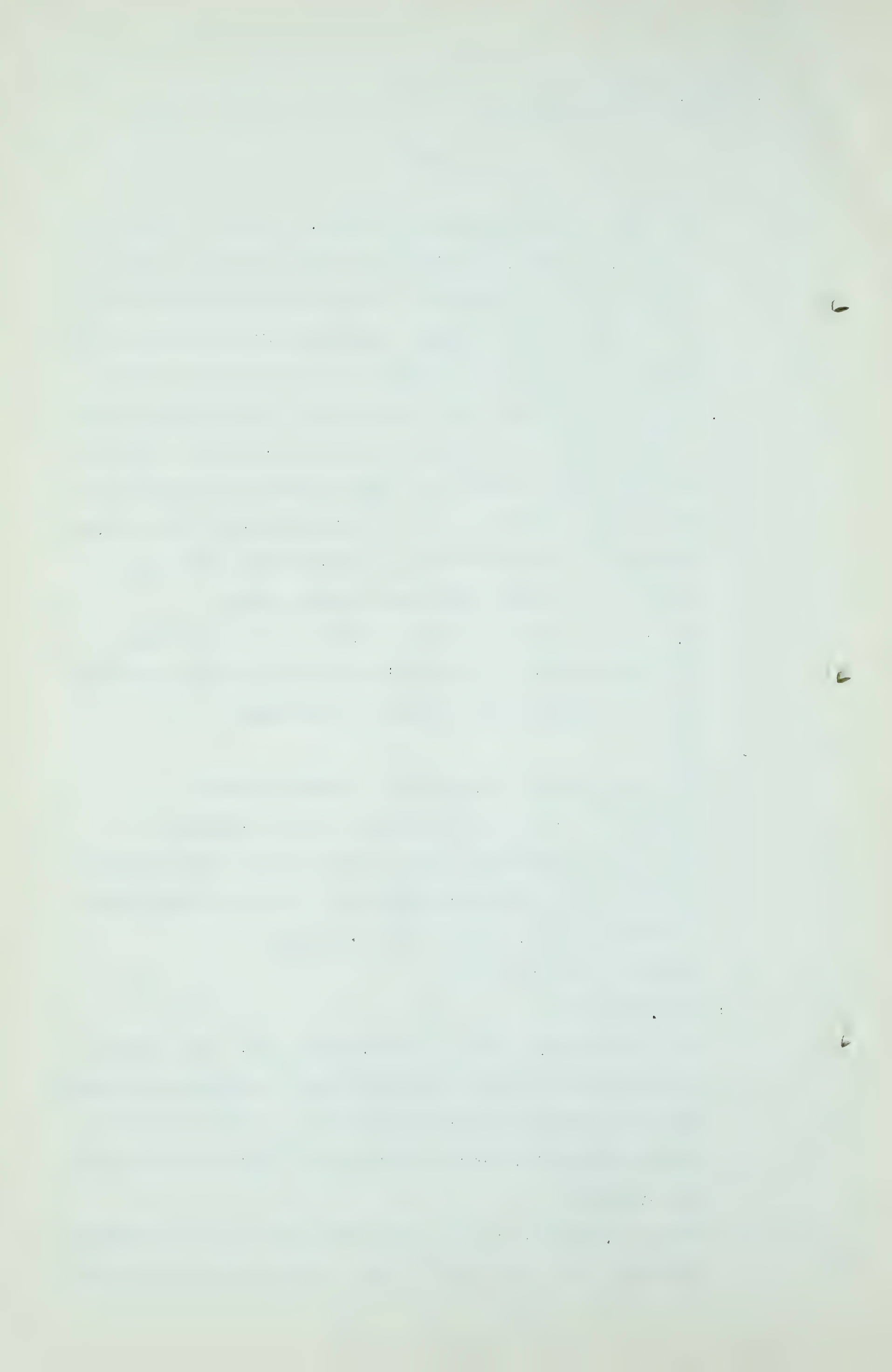
A I think that is correct, I am not sure.

Q It may be less or more?

A I won't say.

Q You do not know. Now, just referring, Mr. Davis, again to this matter of acquiring reserves for these two systems, would you recommend that the capital be raised and that these systems now get out and acquire these reserves that they require?

A These companies, as you know, are public utility companies operating under the supervision of the Government, having



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earnings regulated, and I think the credit of either company would permit them to raise, let us say, \$5,000,000.00 to make a purchase, but I would think this, that if they do that and admittedly for the purpose of assuring a future competent gas supply that the \$5,000,000.00 should be permitted to earn a fair return. I would not recommend to these companies or to any other companies anywhere in the world going out and acquiring gas in notable amounts at high cost in comparison to everything else, \$5,000,000.00, just to carry it along so that some time they might be permitted to earn 7% or 8%. But I would say that if the Boards in control of the cities could see it the way I see it they would think it in the long run if they want to think about the cities' interests for 30 years instead of 5 years, that it would be a good thing to do. That is what I think.

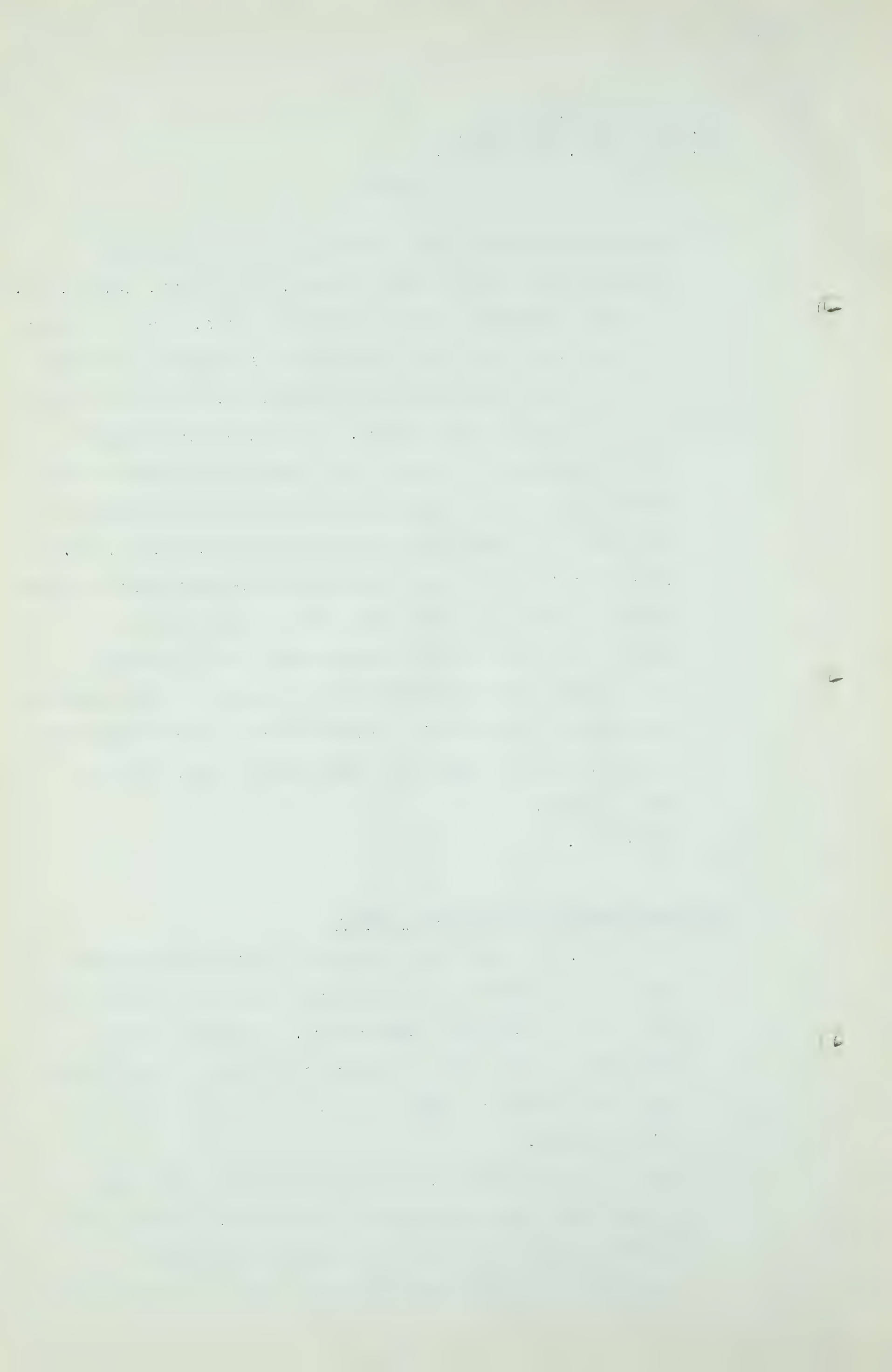
Q Thank you.

CROSS-EXAMINATION BY MR. S.B. SMITH:

Q Mr. Davis, in connection with these additional reserves that you recommend should be obtained for the benefit of the cities of Edmonton and Calgary, I suppose it is desirable to get suitable reserves as close to the places where the gas is consumed as is possible?

A That is right.

Q And I suppose actually, so far as location, and I am talking only about location at the moment, Jumping Pound was from the point of view of location a suitable acquisition for the Calgary system, that is, it was close?



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A That location, so far as I was concerned, dictated its acquisition.

Q Yes, and the Calgary Gas Company is, I believe, in the process of connecting that to its system?

A That is right.

Q Now, if and when additional reserves, as you recommend, are acquired for the Edmonton system, how would you get the gas from that new source to the Edmonton system?

A We do not know where it is, do we?

Q No, but assuming you get it within a reasonable distance?

A I would not acquire it for the Edmonton district unless it was within a reasonable distance.

Q Assuming you acquire it for the Edmonton system within a reasonable distance, how would you get it into the system?

A When it comes to bring it in we would have to pipe it in.

Q And the same thing would apply to the additional reserves which you recommend obtaining for the Canadian Western system, that is, the 750 billion?

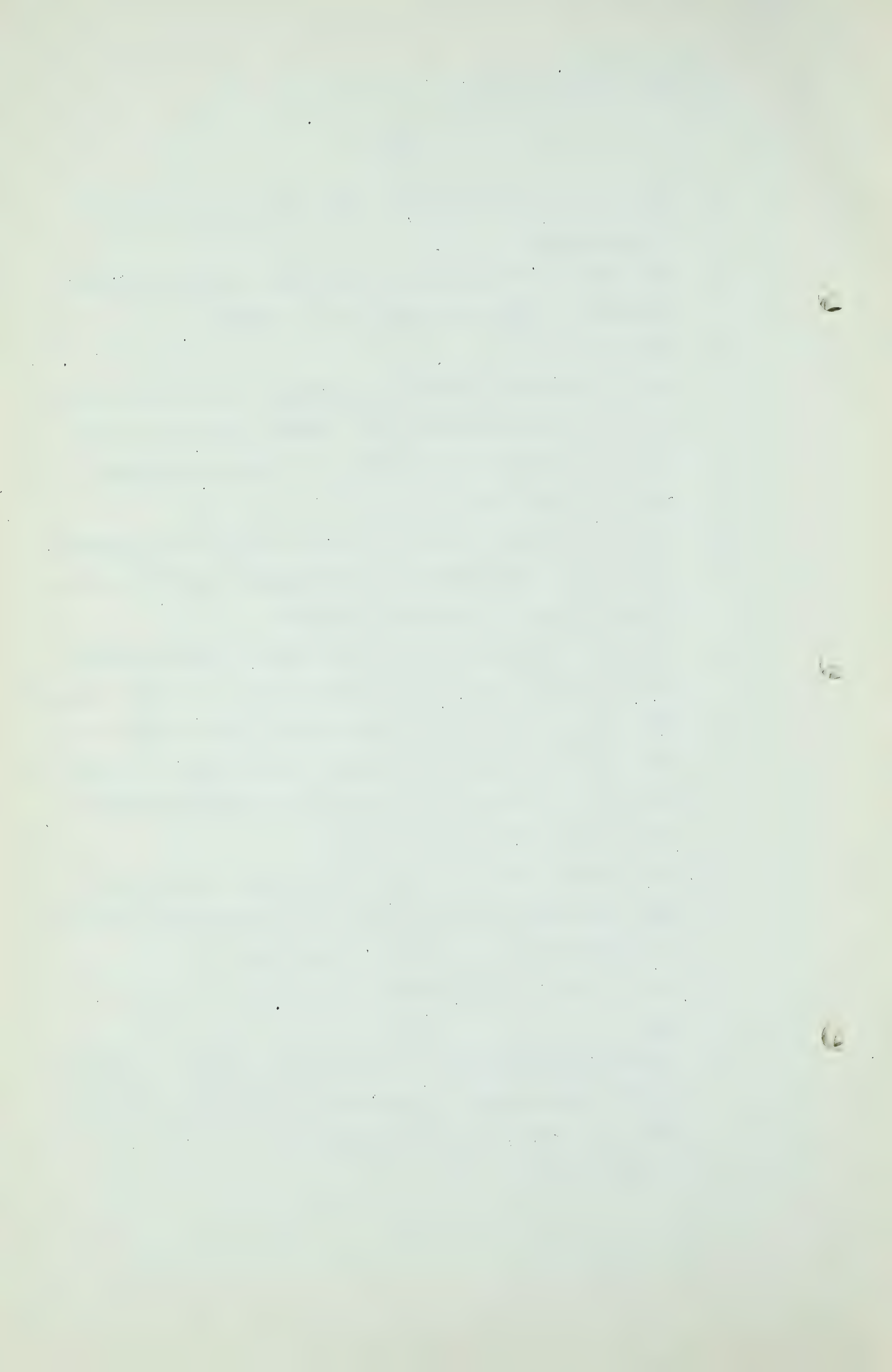
A They would have to be connected by pipe line when the day came that it was essential. If we acquired something for 1951 it might be carried unconnected.

Q Quite, until it was needed?

A Yes.

Q And when it was needed the respective systems of Northwestern and Canadian Western would be extended to those fields in order to bring the gas in?

A I would so do..

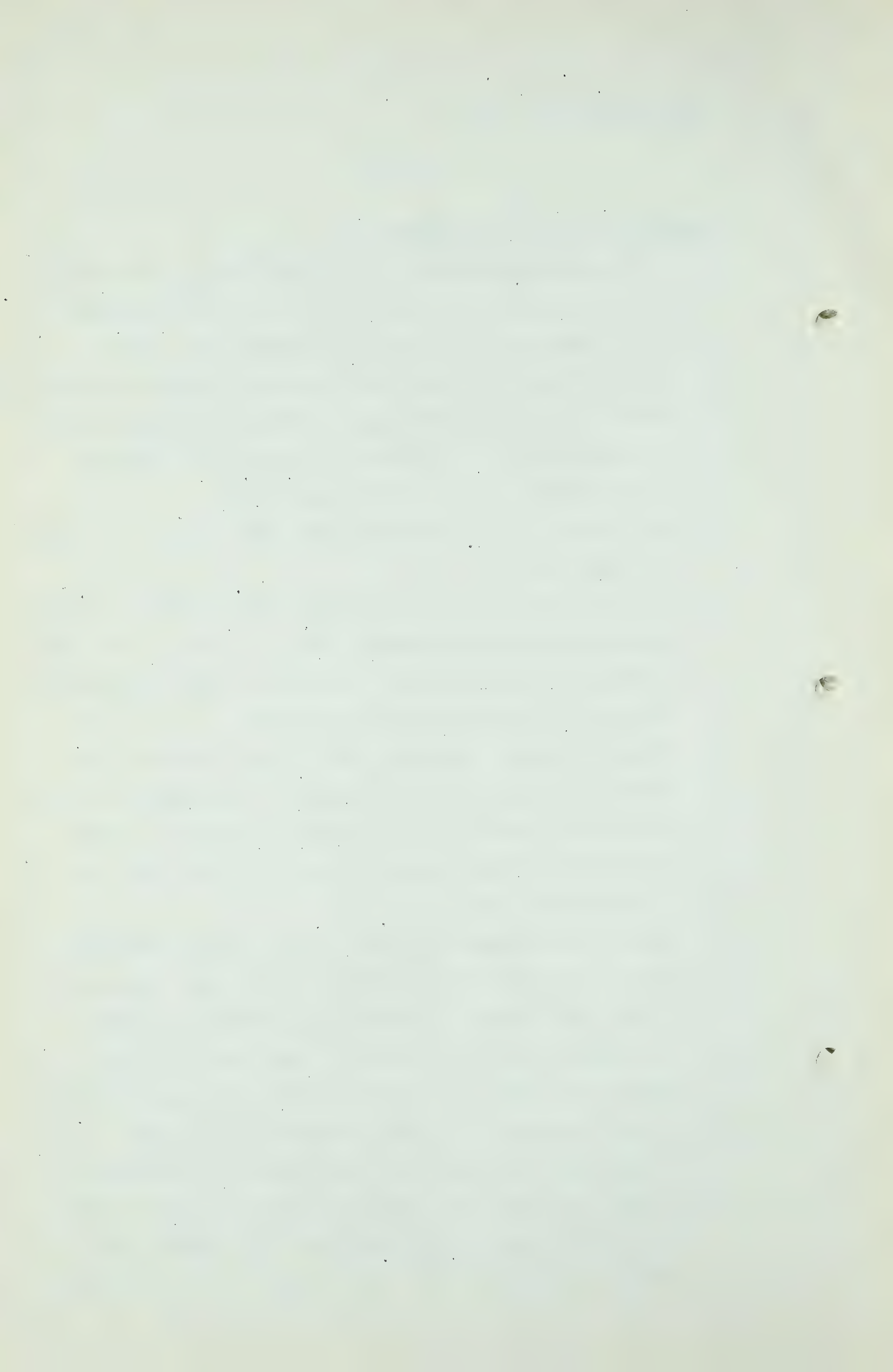


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EXAMINATION BY MR. C.E. SMITH:

- Q I am surprised that all of these applicants are through with Mr. Davis, sir, but I have a couple of questions. If I understood you correctly yesterday, Mr. Davis, having regard to first, the Northwestern anticipated supply, they will require their present Viking-Kinsella-Leduc and the additional 500 billion of reserves to be acquired before 1960, is that correct, Mr. Davis?
- A As near as I can judge it at this time. That is the way it looks now.
- Q And just to continue with what Mr. Smith and Mr. McDonald was asking you with respect, first, to this 500 billion, have you given any study or thought to first location with respect to where it might be acquired?
- A Well, of course, you will read into my statement, even though I did not write it in, that I am assuming that the gas in the Leduc field will become available to Northwestern even though present contracts do not cover it.
- Q I understand that.
- A That is my assumption. Now, I have thought about the possibility of an additional supply for that situation. I feel that there is a very real possibility of more Devonian oil fields being found than have been found, that we may find another Leduc with a good gas cap and it may be within 50 miles of Edmonton or 75 miles. It would seem to me that with this program of exploration going on and with the prospect of success that it would not be necessary for Northwestern to go rushing into a deal in December, 1950. I personally would be inclined



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to see what happens through the country, see if they do not find another good gas cap somewhere.

Q At the present moment, Mr. Davis, have you any particular area or location or locations in mind as of today with respect to this?

A Where these new discoveries might be found?

Q Yes, I will go that far with you.

A Well, if I knew just where to go - -

Q I would think these gentlemen would like your opinion because if I understand you correctly you have not left much for export at the moment, that is what I want to get at.

A I have always thought well of trends. The first oil people to develop oil fields back in Pennsylvania in the 1860's found it occurred in a northeast and southwesterly trend. They just found that that was the case. And I would be more inclined to stick my neck out and drill a well on the trend of Leduc-Woodbend stuff than to go over into Saskatchewan, for example. I was only trying to make my point.

Q That may help some of these gentlemen, even your suggestion about trends.

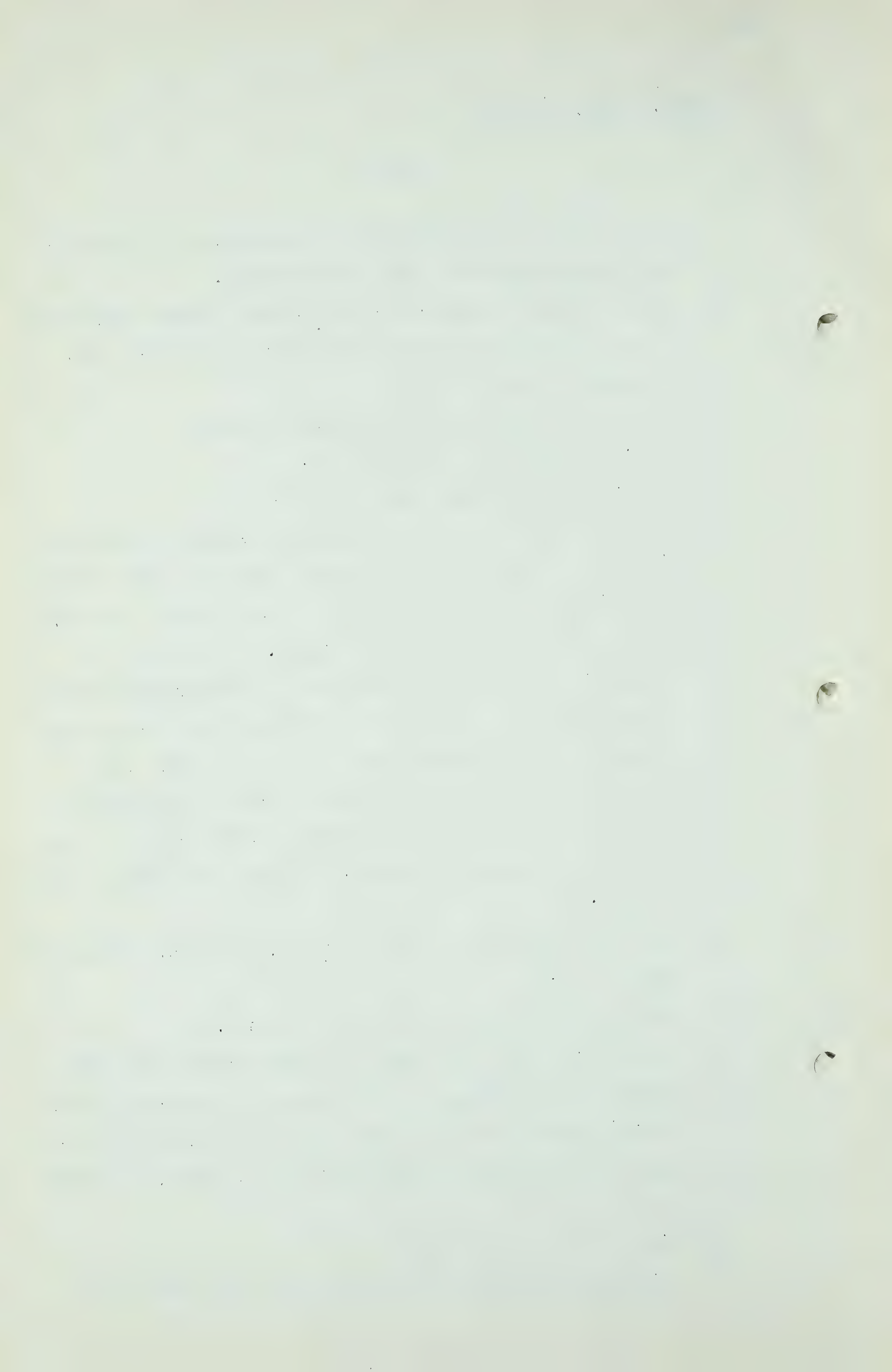
A They all know as much about that as I know.

Q By the way, Mr. Steer asked you about Pakowki Lake and Princess this morning. As he did not ask you about Morinville, can you assist us with respect to an opinion on it?

A You are referring to something north of Edmonton, are you not?

Q Yes.

A Well, I would like to say this, that I have made some



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study, it is maybe a year and a half old. At that time I did gather the information that was then available. It was a study made for people who were spending their money to find out things and I do not feel that I am at liberty to discuss it. I think that you have other witnesses who will tell you all about Morinville.

Q We have some of them. That is why I hoped you could tell us something about it.

A I feel it is just a little - - well, I just believe it is not necessary for me to go into the fields north of Edmonton since you do have other witnesses to tell you about them.

Q You mean, you may have an opinion with respect to it but you feel you are not free to discuss it, is that what you mean?

A That is how I feel.

Q Because of your connection with other clients?

A That is right.

Q Well, I am not going to ask that you be directed by the Chairman to answer it. You prefer to leave it as you have just told us?

A I believe that is the right way about it.

Q Is there any other field you can give us any information about, not being in the same position as you are in respect to Morinville, that you have not already dealt with, I mean, Mr. Davis? I would like to help these people. I would like to find some prospects of gas for you, to tell you candidly?

A I feel that if it were possible to develop this thing

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into a situation where there would be plenty of gas for the Alberta picture, as we see it, and for export that would be the best thing for everybody. I am not opposed to export just because it is export.

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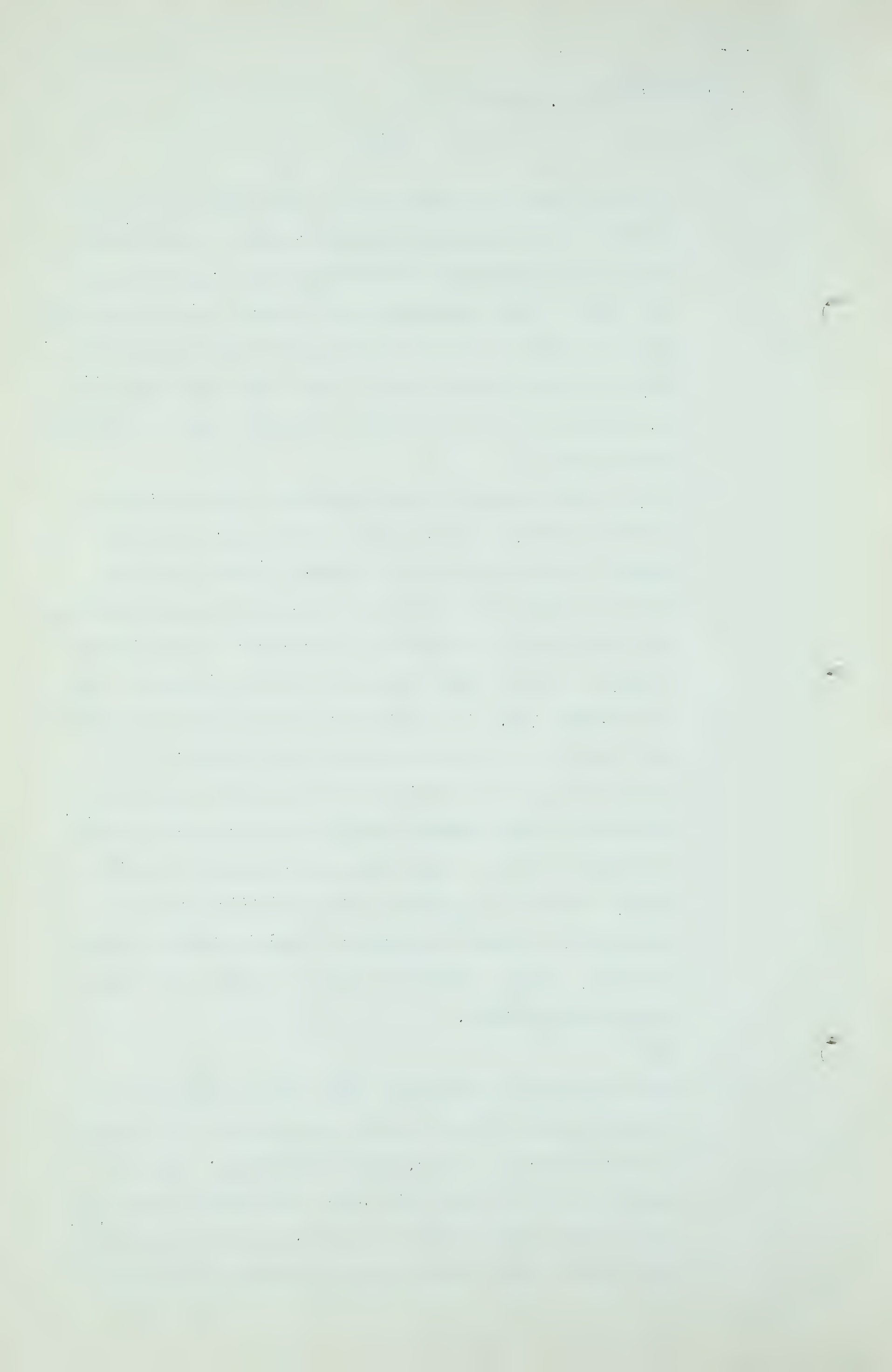
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Q I did not mean to suggest that. I will put it in a nutshell in this way, having regard to what you have said about the requirements of Northwestern, say, through the next 30 years, having regard to what you have already said with respect to the requirements for Canadian Western, what, in your opinion, have we got left after those requirements are taken care of? Can you assist me in that in any way?

A Well, I have thought on that subject a good deal, and I will say this, as most anyone would know, that the longer a pipe line is, for example, a 1000 mile pipe line as compared to a 200 mile line, it becomes essential for that long line to carry a substantial annual amount of gas. It must have behind it far more reserves than the shorter line. I frankly feel that it would be difficult for me, I do not know about other people, but I believe it would be difficult for me to be optimistic in reporting on the reserves behind a pipe line project out of Alberta to go as far as Vancouver, or as far as Winnipeg, unless it was pretty sure that that line had a capacity to deliver its expected annual load for about 20 years. These companies require usually that long to amortize themselves.

Q Yes?

A And I believe that lines of that distance have got to be large enough lines to carry something on the order of 100 billion feet a year, maybe 75 billion. And if they are to be of that size, they are going to have to have $2\frac{1}{2}$ or 3 trillion feet of gas, and they cannot have that for 20 years unless there is another 500 billion



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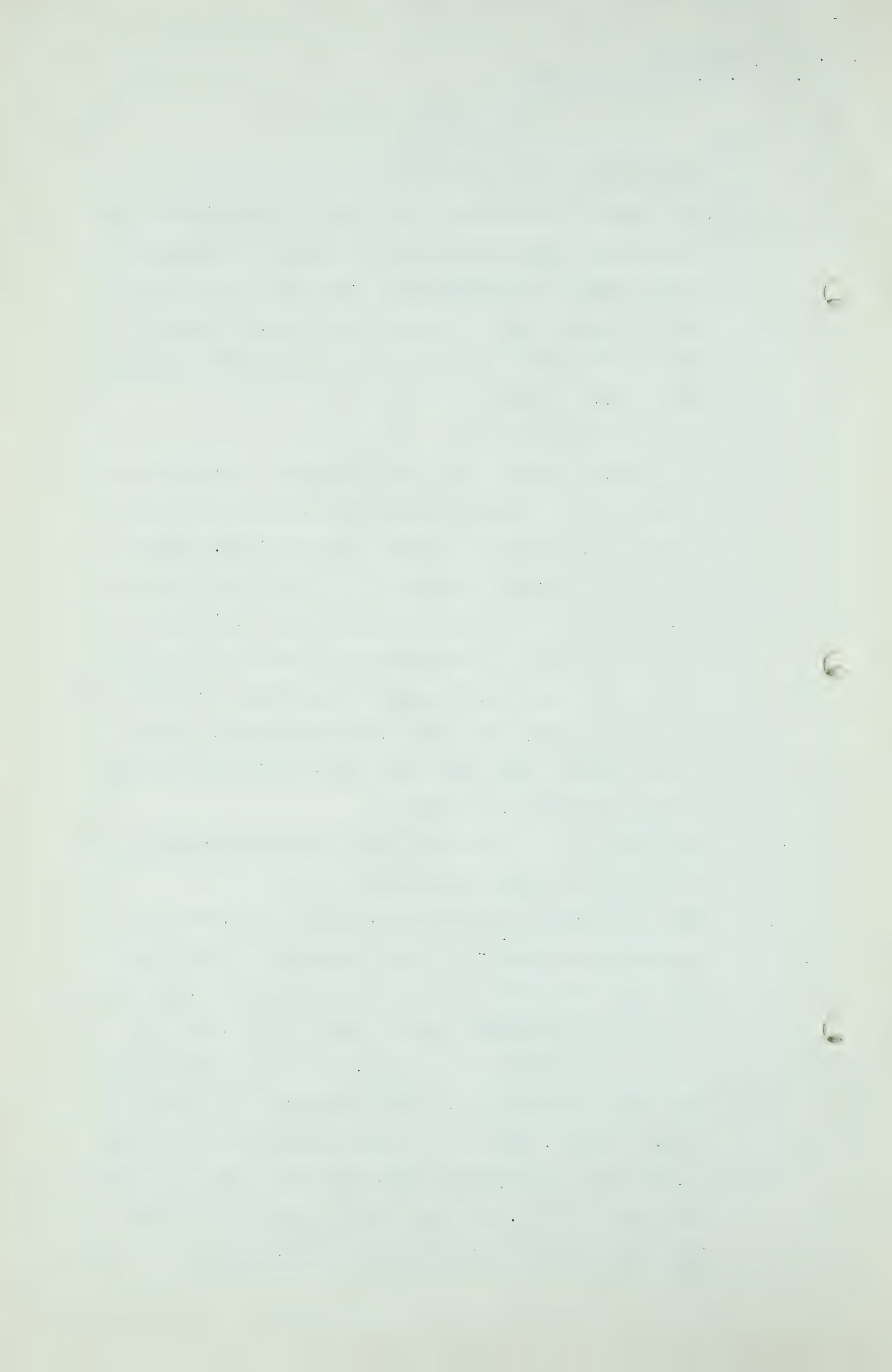
in the ground to push the gas into their lines in the 20th year. I am saying this, that it seems to me that one of these long major projects should be assured of a gas supply of something over the order of 2 trillion feet or more. Now, to raise the 2 trillion feet, I think that maybe this field out here that Gulf has got two or three wells....

Q You mean Pincher Creek?

A Yes, Pincher Creek. That field may have anything from 1 trillion up. I do not know what it has got. The Pakowki Lake country, I think, has around 250 billion. It might be possible to plan out a pipe line based on those fields. That might be possible. Personally, if I were responsible up here for the future of a utility company like Canadian Western, I would want to be assured of some gas beyond that which Canadian Western now has. At this moment that might mean some part of the Pincher Creek or Pakowki Lake thing.

Q Supposing you took your 750 from there, that would be an illustration of what you mean?

A Yes. We would not require the whole 750, maybe 500, we might be willing to be less insistent on that point. We do not know what Jumping Pound is going to amount to. It might be materially better than I have guessed it. No man can do much more than guess at it. You cannot get these estimates on a field with two wells down to a refined point. However, I call it roughly 400 billion recoverable, recoverable pipe line gas. Maybe it is 700 billion, and if it be that, that is 300 billion right there of that 750 billion we were talking about.



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Q Yes?

A In any case, it would be just my feeling that this is a very involved problem. I feel that people who have come in here in good faith, taken up lands, paid rentals, drilled wells, and when they got dry wells said not a word, if they got oil, they said "Good", and if they got ^s gas they said "Well". Personally I would like to see that sort of thing continue. I would like to see people come in and drill those kind of exploratory wells. I do not believe they will do much of it if they find it impossible to market their gas, so that it is a very involved question.

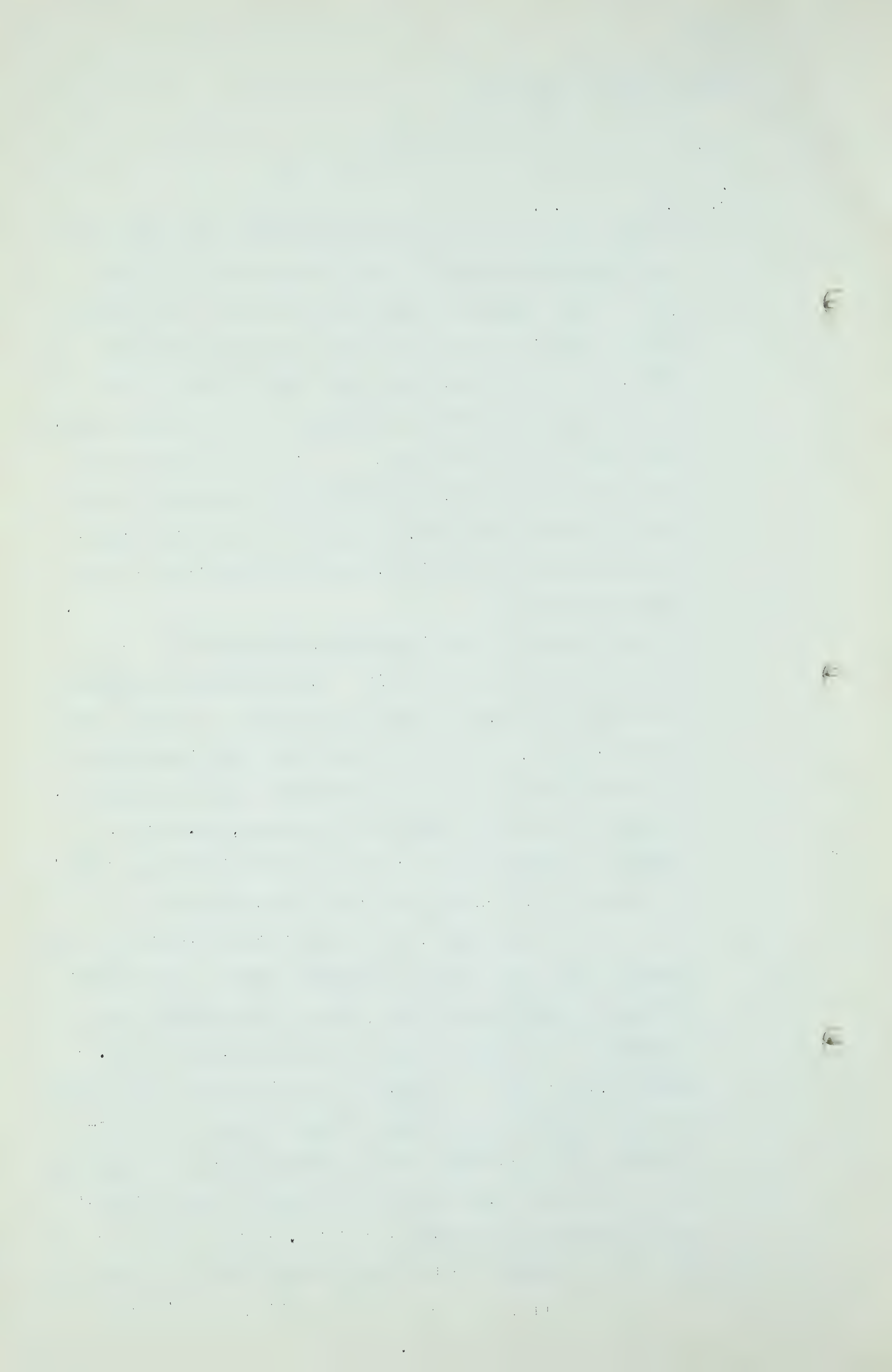
Q In other words, we are back in our old circle?

A It is a very involved problem. It is extremely involved.

Q You mentioned Jumping Pound a minute ago, Mr. Davis, and I think you used the words "Your best intelligent guess" or I have forgotten how you phrased it, but what opportunity did you have personally to examine data with regard to Jumping Pound? Will you tell us briefly for the benefit of the Board, can you tell us that?

A Well, yes. I will say that work was done, I believe, last January, because my client, Canadian Western, were very seriously considering either making a move towards acquiring gas at Jumping Pound or acquiring gas in the Pakowki Lake area. I studied every thread of information that was available at Jumping Pound. I went to the Conservation Board and got out the samples of all the cuttings from both wells, or three or four wells, I don't remember, looked at everything.

Q You saw, of course, some back pressure tests, I take it,



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or did you get a chance to examine them?

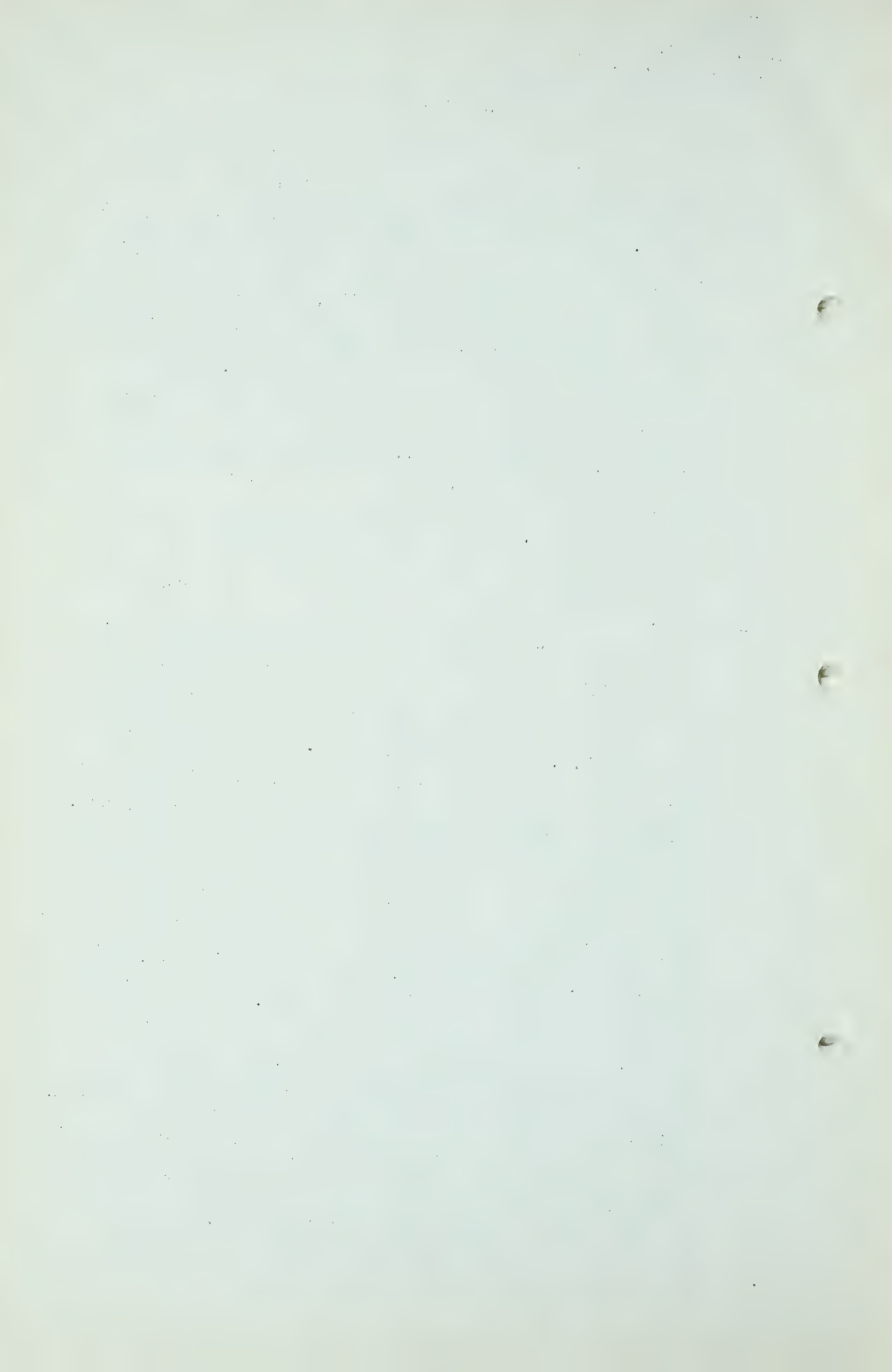
A I was around at the time when one of those wells was drilled. I have been out there at Jumping Pound several times, and I was rather impressed with what was reported at the time the wells were new wells, that they had been rated around 15 million, and I was more impressed with that than I was with the back pressure test. The back pressure tests made at Jumping Pound are possibly very dependable, but I believe....

Q Possibly what? I didn't get what you said?

A Very dependable.

Q Very dependable?

A Yes. But I am not sure that, I am not sure that those wells can be regarded as 30 or 35 million foot wells, and I will not be sure of that so long as the slope of the curve on a back pressure potential test is on the order of 1.2. A slope of .85 or .9 is generally regarded as a dependable type of slope. And when you get less there can be less certainty attached to the study. and to the result. I am not certain that those wells are 35 million foot wells, but I am certainly not in any position to say they are not. I went into the thing, Mr.Smith, with all I had, but there wasn't very much to go into. If there had been 10 wells, or, I should say, if there had been 100 wells to study, I might have studied a long time, but there wasn't very much to go into. I went into all we had and came out with the conclusion and stated it to Mr. Milner at the time that if he could make a suitable deal with Shell I thought it was a very highly desirable thing to do.



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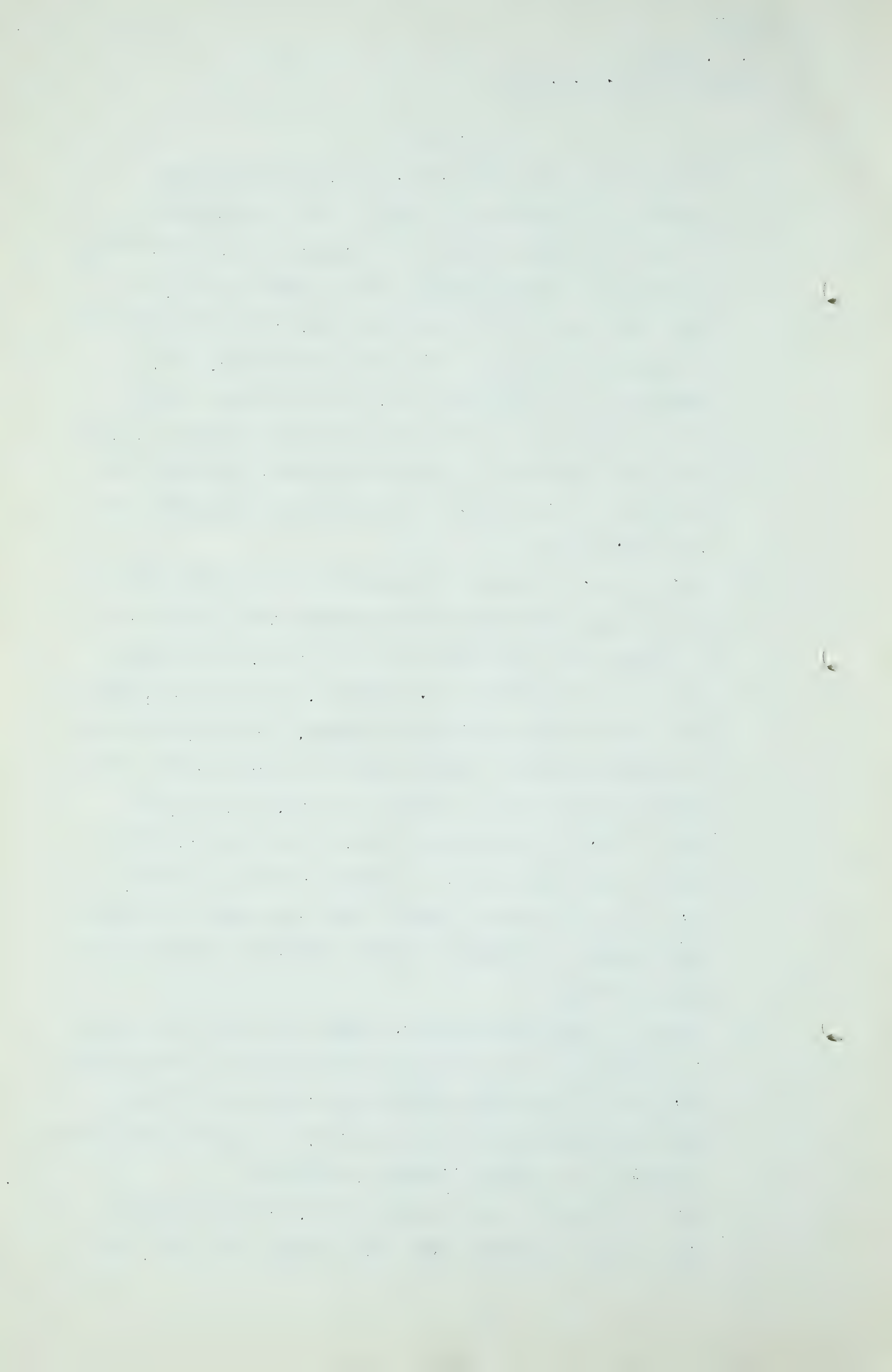
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Q May I mention one thing, Mr.Davis, and that is the question of thickness out there. You may remember or may have seen the evidence of a number of witnesses before the Board in other Hearings, two or three anyway, of them with regard to the thickness out there, and they had an estimated thickness out there of 147 feet. Your thickness, as I remembered it, was 120 feet. Can you give us some idea of how they arrived at a figure of 147 - when I say arrived at I mean an opinion - and you gave an opinion of 120 feet. Can you give us something on that, Mr.Davis?

A Yes, I can. I went to the offices of the Conservation Board where I was courteously afforded the opportunity of studying the cuttings from those wells, and in that study I was assisted by Mr. Paterson, a petroleum engineer with the Canadian Western Company, and we considered, we started in and we counted the feet represented by the porous horizons and it added up to 120. I could not make it 130, I had to make it 120. And up until the time of that visit there, I believe it was in January, 1950, I was told that I was the first geologist or engineer sufficiently interested in those cuttings to come in and ask to see them.

Q There is a gentleman named Dr. Hume that has been referred to, although he has not given evidence here at the present time, but he has been quoted quite often, and I think some time ago he said that it was 147. You have had no opportunity to discuss thickness with him?

A No, I am sorry, I did not know that Dr. Hume had said 147. I had forgotten that. But, anyway, all you have



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got to do is to look at the cuttings.

Q That is the way that you arrive at it? That is what I wanted to get at?

A That is the best way to arrive at it.

Q You arrived at it with the assistance of Mr. Paterson?

A Absolutely.

Q I think that is all I have. I won't ask anything else.

Q DR. GOVIER: Mr. Davis, I wonder if I might ask you a question in connection with abandonment pressures and with regard to your idea of abandonment of wells? Some time ago the Board received evidence to the effect that wells might economically be operated to quite a low abandonment pressure in the light of the fact that well head compression could be carried out today to around 3 mills per compression ratio per MCF. That would seem to indicate that it might be possible to go as high as 3 units of compression ratio for 1 cent per MCF. Would you agree with that general notion?

A Well, I would not fight with those figures. 3 mills for 1 compression ratio, I think that is all right if we can put our compressor plant in and keep it in operation for quite a while. You have got to keep it running until you have amortized the difference between what it has cost us and what it is worth as salvage.

Q Either that or have some other use for the compressor afterwards?

A Well, I am saying the difference between what it is worth as salvage and what it was worth.

Q Yes?



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A I think in the average case you have it running more than 3 mills on account of the thing I have just pointed out, but in any case we have lots of trouble sometimes in taking wells down to these lower pressures. We have trouble today in the Kinsella field. There is unexpected trouble with several wells making water. It was quite a surprise to me, and I am a little bit disturbed by the information on these wells. Fortunately, they are all in one northeast segment of the field. That indicates to my mind that that part of the field is not as good as I thought it was when I told Milner to buy it, and it indicates that we may not get the gas down under 200 pounds in Kinsella. We have already abandoned one well there, I mean, Northwest Utilities, a new well drilled, and operated it for about a year and abandoned it on account of water trouble when the pressures in the field are 600 pounds.

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- Q Do you believe, Mr. Davis, that water trouble may be general over a wide area of the field or do you think it will be localized to certain fringe areas?
- A I think it is likely to be localized but every time you take out a few square miles, you know. This thing here is now prevailing and three or four wells, they might control a total of 10 or 15 square miles.
- Q Suppose for a moment we talk about the rest of the field, the central portion, let us say half of it, the central half?
- A The place where the sand is 12 feet thick.
- Q Yes, where the sand is 12 feet thick. Do you believe the Board would be justified in assuming that in that area for an additional 1 cent or cent and a half per Mcf it might be possible to recover gas down beyond 200 pounds abandonment pressure, perhaps to 70 pounds or 75 pounds abandonment pressure?
- A That is exactly what I think. I think in the central portion of the field you will take the gas pressure down, if the gas is then needed, I think you will take it down to 100 pounds and maybe less. But there is going to be a very large outlying area within the field where it will be 300 pounds or 250. I think the average could - well, you could only judge it - but I think it will be around 200 pounds average. Some of it will be substantially less and some of it substantially more.
- Q But when you mentioned the figure of \$2.00 you were really joking rather than being serious, were you not?



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A Certainly. I have to joke with Mr. Fenerty.

MR. FENERTY: I was going to suggest \$5.00.

Q DR. COVIER: Would it be reasonable for us to take the view perhaps there might be 1 or 2 cents differential on the gas from 200 pounds down to a lower figure but not a tremendous differential?

A Well, I am sorry. I was willing to take the gas down under 200 pounds in that best part of the field, but I still think that it will average around 200 pounds. Take it out where this water is giving trouble right now. I do not know whether we will get that pressure down to 200 pounds or 300 pounds. I do not know.

Q You feel it might not be possible to deliver gas from the edge wells, but do you think that that gas would never be produced, or could it be produced through the central wells? Would not the gas migrate to the central wells and be produceable from there?

A It might be, yes, sir, in the best part of the field. It will produce gas depending on the line pressure that is maintained and the compressor power. I think it might vary down to 100 pounds probably, maybe less. But I also think there is going to be a substantial part in the whole field where the pressure will even at that time be well above 200 pounds and the flow of gas will be so slow that it won't matter very much. I gave you a bunch of graphs the other day. If you care to look at them, you will see the last 5 or 10 years in the life history of some of these fields and the amount of gas taken out during that time was maybe 2% of the field total. In fields that had delivered

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10 or more per cent in years past - when you get down to this last drag you can keep it going possibly for many, many years. You may bring the average pressure in the Kinsella wells under 200 pounds. You may, but it is going to be, in my judgment, expensive to do that. That is what I meant when I told Mr. Fenerty it was going to be expensive.

Q What I am trying to reconcile in my own mind is the \$2.00 figure which you mentioned jokingly, and the 1 or 2 cent figure which I seem to arrive at when I consider the number of compression ratios that might be involved for part of the gas?

A You are taking the gas down to 75 pounds, let us say, from 200 by spending an additional cent and a half per Mcf. Fair enough. You still have not spread the pressure in that field down under 200. You have merely got the central zone, the best part of the thing, down to 75 pounds. The rest of it is still 250.

Q You believe the equalization would be so slow that we might almost neglect it?

A I think it would be very slow. Even 30 years would not be likely to cover it. If you should take that pressure down to 75 pounds this winter, if that would happen, I expect that the 30 years would be plenty of time, but it is not going to be that way. It is going to be 10 years or 15 years before you get down to 300 pounds. With the gas we are taking now that might equalize matters. That might happen a long time from now.

Q Another point, Mr. Davis, I wanted your further views on,



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and that is the question of the economic number of wells that you believe might be drilled in an area like the Viking Kinsella. You suggest a figure of 150. Would you care to amplify your evidence on that line a little more and indicate to us whether or not it might be as high as 200 or whether it might be less than 150?

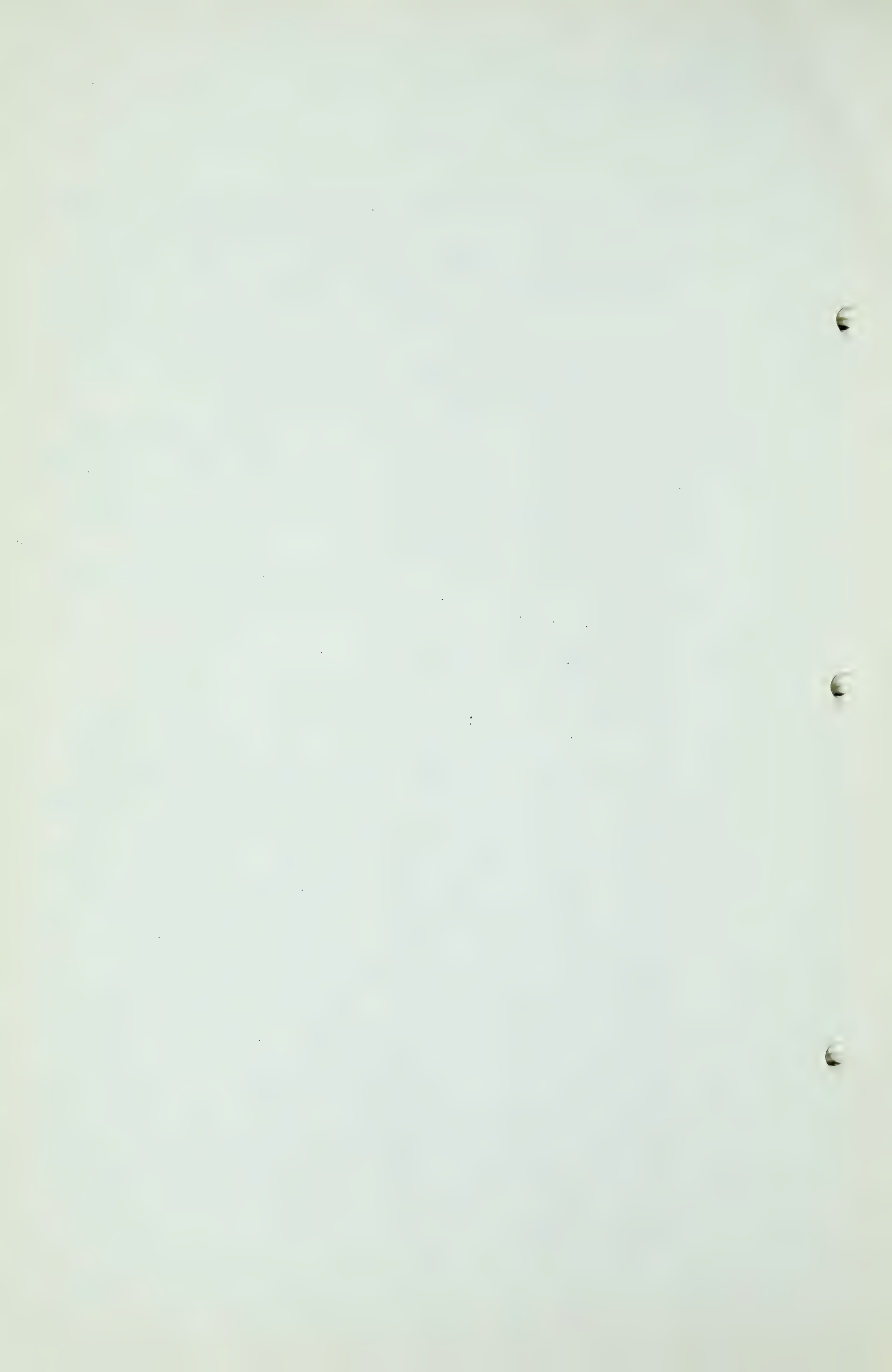
A That field has an area, I believe, of about 380 square miles. Does anybody remember? Is that right? Is it 280? I cannot remember it at all. How many square miles is there in the Viking-Kinsella?

MR. C. E. SMITH: I think someone has said it was 245,000 acres.

A That might be all right.

MR. BROWNIE: About 385.

A 385 square miles. If we drill a well each square mile, that would be 385 wells. If we drill a well every two square miles, it would be just under 200 wells. I think I gave you a figure of 150 wells and I said that would be about 1 well to each 2-1/2 square miles. My thinking on it was following this line of thought that there must be enough gas available to an individual well to make that well a commercial success. You have to take enough gas out. If we drilled too many wells in the field we would over-well it. Too many gas wells for the amount of gas. In the light of the situation as I see it in Alberta now, with gas worth roughly 10 cents a thousand in the field, that is what is being paid in some places, take Turner Valley, 10½ cents.



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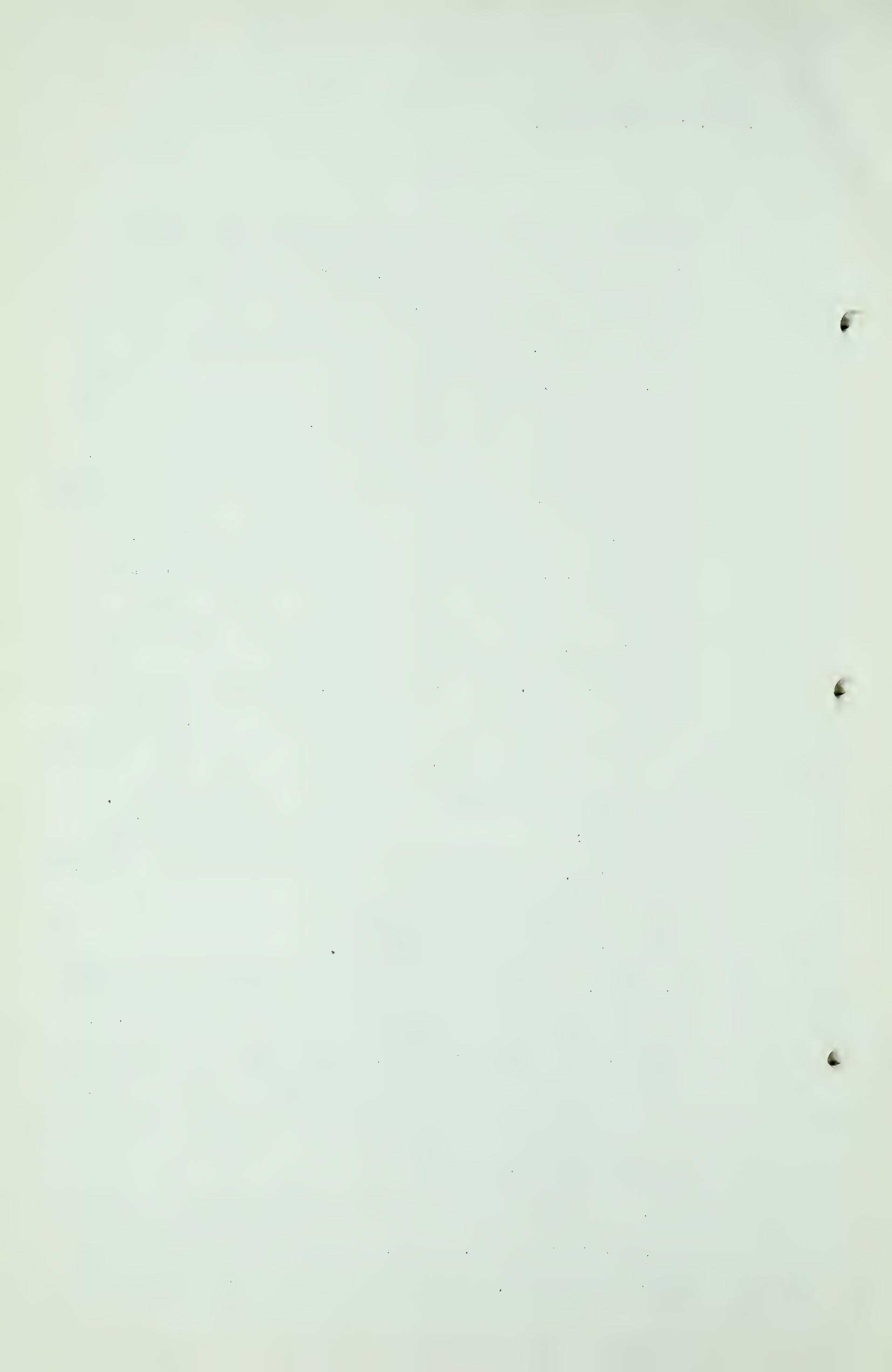
A I think that a well to be a nice success and suitable, including its gathering line, probably ought not to be more closely spaced in that field than 1 well to about every $2\frac{1}{2}$ miles. That would be about $4\frac{1}{2}$ billion feet per well, I think. Just about $4\frac{1}{2}$ billion cubic feet of gas would be produced per average well. If we had more wells we would get less gas per average well but we would get the gas a little quicker. The thing can not be determined in 1950, what will be the ultimate number of wells, but we can plan, I think, today as we are planning today right here. I say to you that in the light of the present situation and what gas is worth, I think about 150 wells. Now, if by any chance, gas were to go to 20 cents a thousand I would be willing to shift right up to 200 wells, maybe 225, but with gas at what it is worth now I think we have got to limit the number of wells.

Q DR. GOVIER: You have based your 150 wells, then, on the basis of a reasonable return for each well to pay off its cost and so on?

A That is part of my thinking, yes.

Q Mr. Davis, would there be any merit in basing the number of wells that might be drilled in an area on the incremental cost required to drill additional wells compared with protecting the system's ability as a whole to meet its deliverability demands instead of starting out on an individual well basis?

A Well, I say the individual well basis has been a part of my approach to it. Also, in my approach has been this consideration, that we have got to have enough gas



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in 1960 to meet the expected peak day requirement. It looks to me that is going to take about 150 wells, unless we bring some gas in that I don't know about.

Q Suppose you needed 200 wells in 1965 to meet your demand day requirements, and suppose there were no other fields that were nearby and attractive and available to you, would you consider it reasonable then to drill more wells?

A I would.

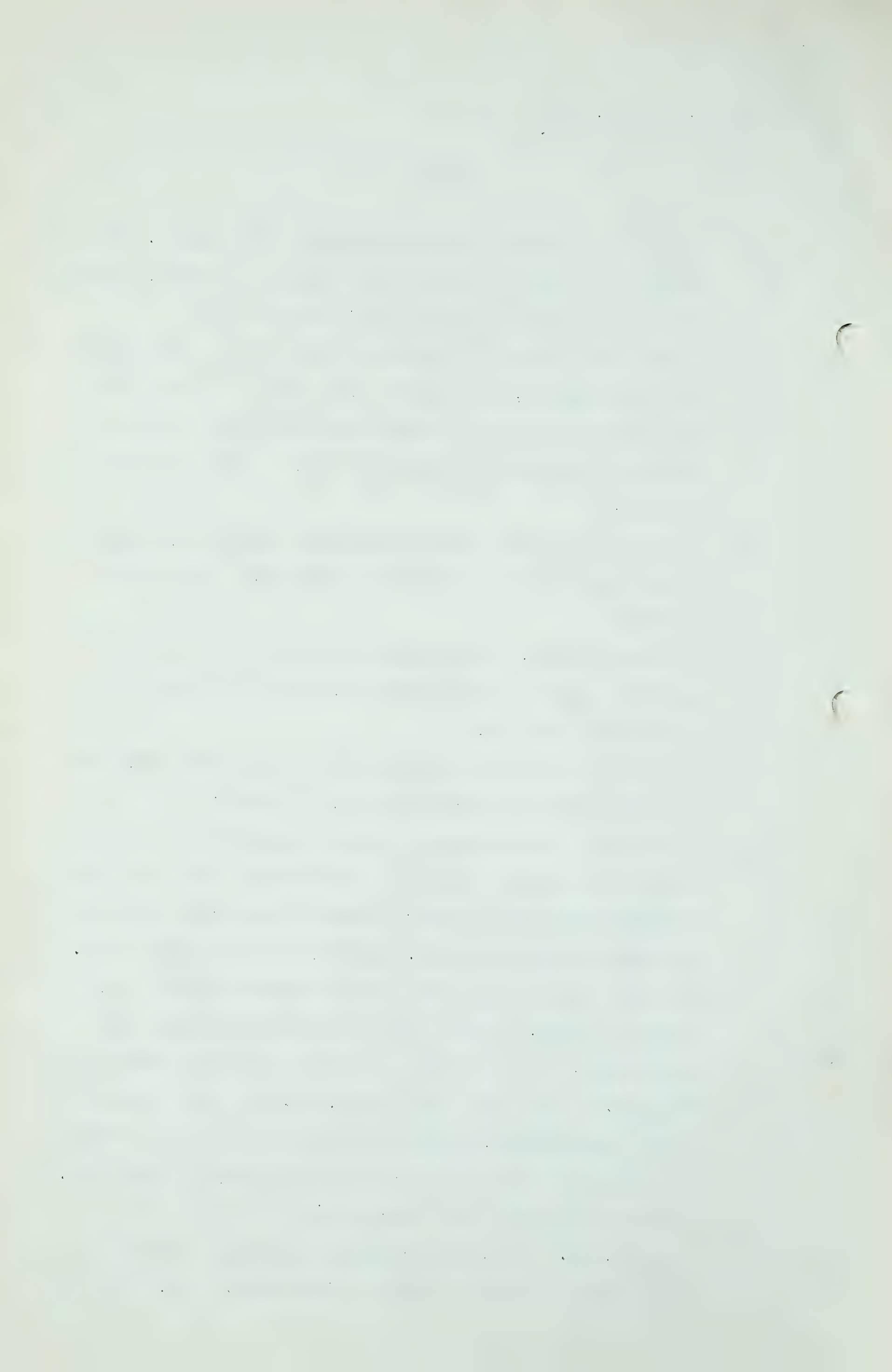
Q And would you drill those wells even though they might not in fact pay out on the basis of individual recoverable reserve?

A I think I would. I would hate to do it but I believe that the major question would be, what am I going to do about this peak day?

Q You would consider all alternatives to meet the peak day and take the most attractive one, I suppose?

A I suppose we would have to do some things we do not like to do. One of the things we do not like to do is cut off interruptible gas in order to meet a peak day. That is a hardship on that customer, probably cost him some money. We will give him his share of the hardship and we will take our share, we will drill some wells that are not profitable. I do not like to go out and drill wells for \$35,000.00 that only bring in \$5,000.00, or go out and drill some \$30,000.00 wells that give 15 to 30. I would be inclined to do that if I were placed in that position.

Q Compared with our local spacing unit of 1 well per section, Mr. Davis, your suggested economic spacing of 1 well per $2\frac{1}{2}$ sections sounds rather wide. Now, you have



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explained that on the basis, particularly on the basis of that amount of reserve being required to recover the costs and I suppose to show an economic, attractive operation.

A I am dealing here, as I think I have said, with a cent. That is not more than 8 feet thick. Now, the thicker the sand the more closely I could afford to drill wells. This is a thin sand as sands go.

Q How much would it work out to on the basis of 10 cents per MCF recovery under $2\frac{1}{2}$ sections?

A 3 million feet per acre and that is about 1500 acres, isn't it? That is $4\frac{1}{2}$ billion feet.

Q $4\frac{1}{2}$ billion feet?

A At 1 cent that is \$45,000.00.

Q Didn't you mention 10 cents before?

A 10 cents is what we have to pay for gas at Turner Valley, or $10\frac{1}{2}$. I am only saying what it is at 1 cent. What do you suppose Northwestern Utilities are getting for this gas up in the Kinsella field right now?

Q I was just going to ask you that question.

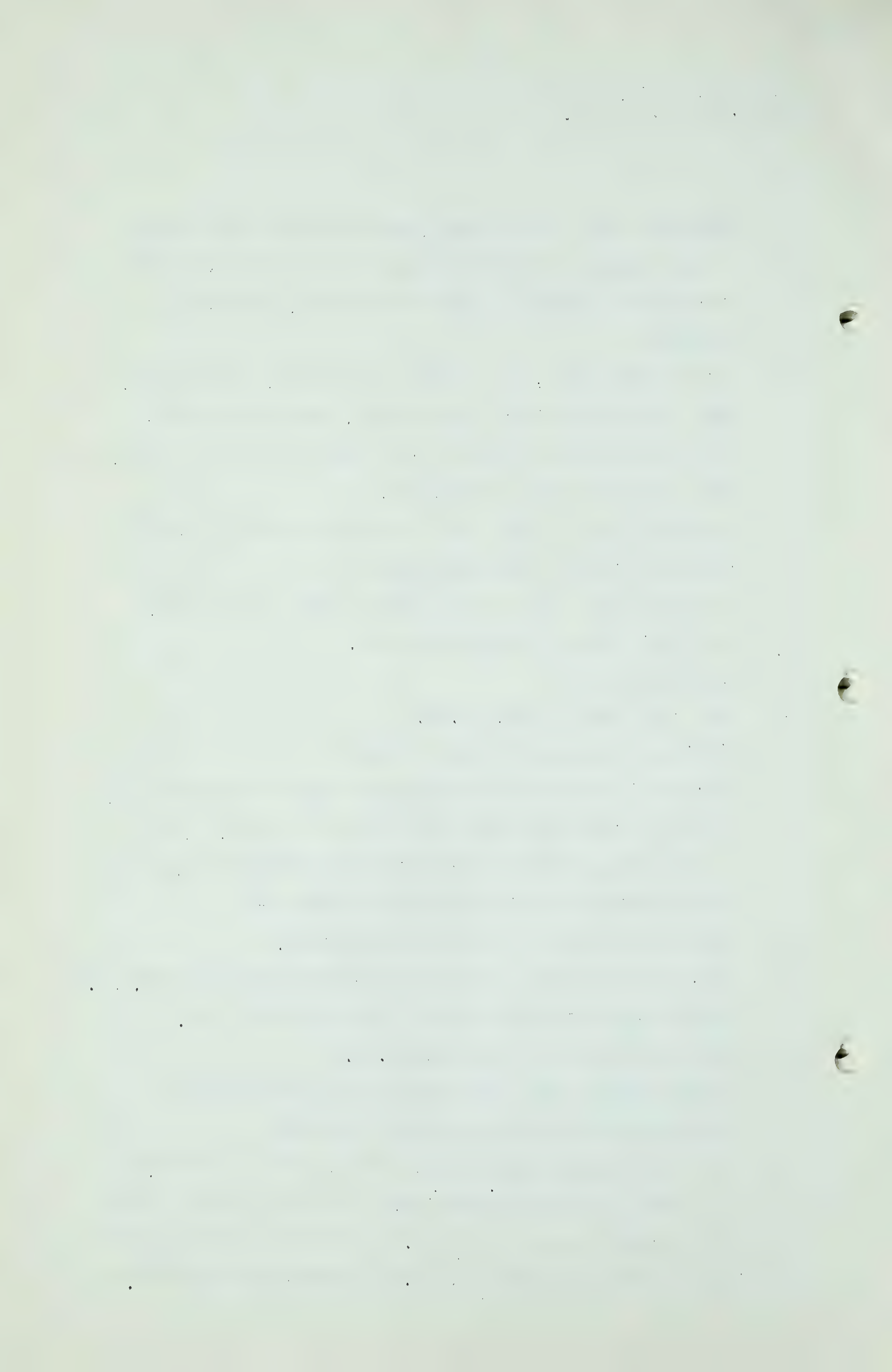
A Well, I expect they are getting 3 cents or thereabouts, $3\frac{1}{2}$.

Q Let us work it out for $3\frac{1}{2}$ or 4 and see what we get.

A Say for 3 cents you get \$135,000.00.

Q Do you believe that much would be required to make it economically attractive to drill one well?

A If I were going to put, say, 1 well on this gathering, its share of the gathering line, it would require a mile and a half of pipe to reach it. I think I would have a cost in there of about \$40,000.00, well and connections.



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Now, how long would it take me to get \$135,000 out of that thing? I am trying to think how much gas the average well at Kinsella delivers today.

Q Perhaps, Mr. Davis, we might pursue this tomorrow, if you would like to do some arithmetic on it?

A Well, I think it is worth doing. I will take a few minutes with you after you adjourn to outline just what questions you would like to follow this with, and I would like to come in tomorrow and try and be helpful to you.

Q All right, thanks, Mr. Davis.

THE CHAIRMAN: We will adjourn until tomorrow morning.

(Hearing then adjourned until 9:30 A.M. Wednesday,
November 1st, 1950.)

